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ABSTRACT

This document presents and explains the development and application of the National Institute for Automotive Service Excellence (ASE) program certification standards that were developed to improve the quality of secondary- and postsecondary-level automobile technician training by implementing a certification program that certifies programs in eight areas: brakes, electrical/electronic systems, engine performance, suspension and steering, automatic transmission and transaxle, engine repair, heating and air conditioning, and manual drive train and axles. The following topics are among those discussed in the document's five sections: (1) policies (purpose and features of the Automobile Technician Training Certification Program, certification process, automobile standards statements, automobile minimum requirements, evaluation team leaders, on-site evaluation teams, task list, tools and equipment, automobile program evaluation, National Automotive Technicians Education Foundation [NATEF] policies on articulation agreements, recognition for certification, applied academics recognition, appeals and action for revocation, educational terms); (2) procedures (process overview, on-site evaluation cost sheet); (3) the 10 program standards (purpose, administration, learning resources, finances, student services, instruction, equipment, facilities, instructional staff, cooperative agreements); (4) task list (task list and assumptions, technical terms, NATEF task list, task list priority item totals by area, applied academics and workplace skills); and (5) tools and equipment (hand tools, general laboratory/shop equipment, specialty tools and equipment). (MN)

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ED 432 670

ASE PROGRAM CERTIFICATION STANDARDS

Automobile

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ASE PROGRAM CERTIFICATION STANDARDS

FOR

AUTOMOBILE TECHNICIAN TRAINING PROGRAMS

Administered By:

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POLICIES

AUTOMOBILE TECHNICIAN TRAINING CERTIFICATION PROGRAM

The Board of the National Institute for Automotive Service Excellence (ASE) is the body responsible for the Automobile Technician Training Certification Program. ASE will grant certification to programs that comply with the evaluation procedure, meet established standards, and adhere to the policies in this document.

The Certification Program is under the direct supervision of the Board of Trustees of the National Automotive Technicians Education Foundation (NATEF) and such personnel designated or employed by the Foundation.

The purpose of the Automobile Technician Training Certification Program is to improve the quality of training offered at the secondary and post-secondary levels. NATEF does not endorse specific curricular materials nor provide instruction to individuals, groups or institutions. It does, however, set standards for the content of instruction, which includes tasks, tools and equipment, hours, and instructor qualifications.

The Program is a certification program only and is <u>not</u> associated with the accreditation role of other agencies.

The cost to each program for certification will be as reasonable as possible to encourage program participation. This cost will include self-evaluation materials, on-site team evaluation materials, and the honorarium and expenses of the Evaluation Team Leader (ETL).

The eight Automobile areas that may be certified are:

1. **Brakes**
2. **Electrical/Electronic Systems**
3. **Engine Performance**
4. **Suspension and Steering**
5. Automatic Transmission and Transaxle
6. Engine Repair
7. Heating and Air Conditioning
8. Manual Drive Train and Axles

Four areas are required for minimum certification or recertification: Brakes, Electrical/Electronic Systems, Engine Performance, and Suspension & Steering.

OPTIONAL
LIGHT/MEDIUM DUTY CNG/LPG
*(*Order Light/Medium Duty CNG/LPG Materials for Details*)*

The Light/Medium Duty Compressed Natural Gas (CNG) and Liquefied Petroleum Gas (LPG) certification areas are optional – supplemental – areas to the existing ASE/NATEF Automobile Program. "Certified Master Automobile Program" certification is not affected by the addition of these alternative fuel areas. Certification in Light/Medium Duty CNG/LPG is dependent on a program meeting the minimum program requirements for certification for Automobile, as well as those requirements specified in the Light/Medium Duty CNG/LPG certification manual.

Programs seeking Light/Medium Duty CNG/LPG certification **must** order the separate Light/Medium Duty CNG/LPG certification materials

Optional Areas for Program Certification and Hours Required
Programs seeking Light/Medium Duty CNG/LPG certification must have their automobile program certified in at least the four required automobile areas or must certify in Electrical/Electronic Systems (area 2) and Engine Performance (area 3) and articulate with another program for Brakes (area 1) and Suspension & Steering (area 4).

Programs may certify for LPG only, CNG only, or both CNG and LPG. Areas 2, 3, 9, and 10 are required for minimum certification of LPG programs. Areas 2, 3, 12, and 13 are required for minimum certification of CNG programs.

9. LPG Diagnosis and Repair
10. LPG Maintenance
11. LPG Conversion/Installation
12. CNG Diagnosis and Repair
13. CNG Maintenance
14. CNG Conversion/Installation

CERTIFICATION PROCESS

Program Self Evaluation

The certification process begins with an extensive self-evaluation performed by training program instructors, administrators, and advisory committee members. Members of this group compare the program to national standards, and have the opportunity to make improvements before submitting evaluation documents to NATEF.

NATEF Review

Self-evaluation materials are then sent to NATEF, where they are reviewed to determine if the program qualifies for an on-site team evaluation.

On-Site Evaluation

If the program qualifies, an Evaluation Team Leader (ETL), an educator certified by ASE and trained by NATEF, is assigned to the program and an on-site visit is conducted.

Recommendation for Certification

When industry requirements are met, the program will become certified for a period of five years.

Programs will have a maximum of 18 months to complete the certification process from the date that their Application for Certification or Application for Recertification is received by the NATEF office.

Any ASE certified program that has let their certification lapse for two or more years will be required to follow the procedures for initial certification when they apply for renewal of their certification.

Programs having difficulty in meeting the hours or tools & equipment certification requirements should consider the following options:

A) Initiating an Articulation Agreement with another secondary or post-secondary training institution (see NATEF Policies on Articulation Agreements).
B) Borrowing equipment needed for instruction from a manufacturer, dealership or independent repair shop.
C) Arranging for instruction on tasks requiring equipment not available in the school program at a dealership or independent repair shop.

Programs choosing option B or C are required to show documentation on where the tasks are taught, by whom, and how students are evaluated.

AUTOMOBILE STANDARDS STATEMENTS

STANDARD 1 – PURPOSE

The automobile technician training program should have clearly stated program goals, related to the needs of the students and employers served.

STANDARD 2 – ADMINISTRATION

Program administration should ensure that instructional activities support and promote the goals of the program.

STANDARD 3 – LEARNING RESOURCES

Support material, consistent with both program goals and performance objectives, should be available to staff and students.

STANDARD 4 – FINANCES

Funding should be provided to meet the program goals and performance objectives.

STANDARD 5 – STUDENT SERVICES

Systematic pre-admission testing, interviews, counseling services, placement, and follow-up procedures should be used.

STANDARD 6 – INSTRUCTION

Instruction must be systematic and reflect program goals. A task list and specific performance objectives with criterion referenced measures must be used.

STANDARD 7 – EQUIPMENT

Equipment and tools used must be of the type and quality found in the repair industry and must also be the type needed to provide training to meet the program goals and performance objectives.

STANDARD 8 – FACILITIES

The physical facilities must be adequate to permit achievement of the program goals and performance objectives.

STANDARD 9 – INSTRUCTIONAL STAFF

The instructional staff must have technical competency and meet all state and local requirements for certification.

STANDARD 10 – COOPERATIVE AGREEMENTS

Written policies and procedures should be used for cooperative and apprenticeship training programs.

AUTOMOBILE MINIMUM REQUIREMENTS

1. The minimum program requirements are identical for initial certification and for recertification.

2. A program providing instruction in all of the automobile areas must have a minimum total of 1,080 hours of combined laboratory/shop (co-op) and classroom instruction. Tasks related to the eight automobile areas may be taught at different times during the course of study. Therefore, the hours for an individual area are the sum total of all the hours of instruction related to the tasks. Individual areas must have the following minimum hours:

a. Brakes	100
b. Electrical/Electronic Systems	200
c. Engine Performance	250
d. Suspension & Steering	100
e. Automatic Transmission & Transaxle	120
f. Engine Repair	120
g. Heating & Air Conditioning	90
h. Manual Drive Train & Axles	100
TOTAL HOURS	1,080

3. All eight areas are required for master certification designation.

4. **The average rating on each of Standards 6, 7, 8, and 9 must be a four** on the five-point scale. The program will not be approved for an on-site evaluation if the average is less than 4 on any of those standards. The program should make improvements before submitting the application to NATEF for review. **A program will be denied certification if the on-site evaluation team average on Standards 6, 7, 8, or 9 is less than four.**

5. A program may not be approved for an on-site evaluation if the average rating on Standards 1- 5 and 10 is less than a four on the five-point scale. **A program may be denied certification if the on-site evaluation team average on Standards 1 - 5 and 10 is less than four.** Approval for on-site evaluation or certification will be made by NATEF, based on the number of standards rated at 4 or 5 as well as the individual rating on any standard rated less than four.

6. All instructors must hold current ASE certification in the automobile area(s) they are teaching.

7. The program Advisory Committee must conduct at least two working meetings a year and have a minimum of 5 people on the committee. Minutes of the meetings must be provided for review by the on-site evaluation team.

8. The NATEF Standards recognize that program content requirements vary by program type and by regional employment needs. Therefore, flexibility has been built into the NATEF task list by assigning each task a priority number. The priority number indicates the minimum percentage of those tasks, by area, a program must include in their program in order to be certified in that area. The Task List is divided into three priority areas. The following guidelines must be followed:

   95% of all Priority 1 (P-1) items must be taught in the curriculum
   80% of all Priority 2 (P-2) items must be taught in the curriculum
   50% of all Priority 3 (P-3) items must be taught in the curriculum

9. A program that does not meet the minimum hour requirements may be eligible for certification if both of the following conditions are met for the program areas seeking certification:

   a. show evidence that all graduates from the previous academic year have taken the ASE certification examination, and
   b. show documentation that 75% of those graduates passed the ASE certification tests.

10. The concern for safety is paramount to the learning environment. Each program area has the following safety requirement preceding all related tasks:

Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

INFORMATION ABOUT EVALUATION TEAM LEADERS (ETLs)

Evaluation Team Leaders (ETLs) are educators who have been trained by NATEF to lead the on-site evaluation. The NATEF office will assign an ETL once a program has been approved for an on-site evaluation. Every effort will be made to assign an ETL located close to the school to reduce the cost for the evaluation. Three additional team members, selected by the program and approved by the ETL, are required for an automobile program on-site evaluation (see the following page for additional information about team members and on-site teams).

Persons selected as ETLs must:

1. have a minimum of six years of combined experience as an automobile technician and automobile instructor (at least three years experience as an automobile technician is required);
2. have a B.A. or B.S. in Education from a college or university recognized for teacher training by the state; and
3. be a current ASE certified master automobile technician (A1-A8).

Or, if a state does not require automobile instructors to have a B.A. or B.S. degree, the following qualifications will apply:

1. six years experience as an automobile technician,
2. four years automobile teaching experience at the secondary, post-secondary or community college level, and
3. current ASE certified master automobile technician (A1-A8).

ETL training is valid for two years. However, automatic two-year renewal is granted every time an ETL conducts an on-site evaluation. ETLs are required to attend additional training sessions or serve as a team member if they have not conducted an on-site evaluation within two years. This additional training is required even though the individual holds current ASE certification.

Anyone interested in becoming an Evaluation Team Leader should contact the NATEF office at (703) 713-0100 or their state Trade & Industrial Supervisor for more details.

INFORMATION ABOUT ON-SITE EVALUATION TEAMS

The program requesting certification is responsible for recruiting and recommending on-site evaluation team members. The ETL must approve individuals recommended by the program. The on-site evaluation team members must be practicing automobile technicians, service managers or shop owners from businesses in the area served by the training program. For initial certification only, one team member may be an automobile instructor from another school district/system*.

Team members must have:

1. a high school diploma or the equivalent (industry or military training may be considered as the equivalent), and
2. at least seven years full-time experience as a general automobile technician.

ASE automobile certification is recommended but not required.

* An automobile instructor from another school district/system must have a minimum total of seven years experience, which must include three or more years full-time experience as an automobile technician and three or more years of post high school training.

The **initial** certification evaluation team is composed of four individuals: the ETL and three team members. Two team members must be from industry (one from a dealership and one from an independent repair facility). The third member may be from one of the following: a dealership, an independent repair facility or an automobile training program.

The **recertification** evaluation team is composed of three individuals: the ETL and two team members. One team member must be from a dealership and one team member must be from an independent repair facility.

Each program requesting initial certification or recertification must identify their choices for evaluation team members on the On-Site Evaluation Team Member List. An alternate team member choice must be identified on the On-Site Evaluation Team Member List in the event that one of the team members is unable to conduct the on-site evaluation. **The alternate team member must be from either a dealership or from an independent repair facility.**

Team members must not be advisory committee members, former instructors, or graduates of the program within the past ten years.

TASK LIST INFORMATION

An essential element of any curriculum or training program is a valid task list. Automobile technician instructors need a well-developed task list that serves as a solid base for course of study outlines and facilitates communication and articulation of their training programs with other institutions in the region.

It is NATEF policy that the task list developed by the National Institute for Automotive Service Excellence (ASE) serves as the basis for the NATEF task list. Panels of technical service experts from the automotive service industry and vocational education are called upon to develop and validate the ASE and NATEF task lists.

The NATEF task list is used to develop the End-of-Program test, which was pilot tested in the spring of 1996, and became available for use nationwide in the spring of 1997. The ASE task list is used to develop the ASE certification examination, a nationally recognized symbol of competence in diagnosing and repairing vehicle problems.

Additional information on the development of the NATEF task list can be found in the Task List section.

All tasks have a Priority designation. NATEF Standards recognize that program content requirements vary by program type and regional employment needs. Therefore, flexibility has been built into the NATEF task list by assigning each task a priority number. The priority number simply indicates the minimum percentage of those tasks, by area, that a program must include in their curriculum in order to be certified in that area.

- **Ninety-five percent (95%) of Priority 1 (P-1) items must be taught in the curriculum.**
- **Eighty percent (80%) of Priority 2 (P-2) items must be taught in the curriculum.**
- **Fifty percent (50%) of the Priority 3 (P-3) items must be taught in the curriculum.**

TOOLS AND EQUIPMENT INFORMATION

The basic tools and equipment that must be available for use in the automobile program are listed in the Tools and Equipment section. Many tools and much of the equipment are the same for some or all of the program areas. However, some equipment is specialized and must be available for use in the selected program areas. These individual program area lists are included in the Tools and Equipment section.

Although no brand names are listed, the equipment and tools must address the following programmatic issues:

1. Safety - Equipment and tools must have all shields, guards, and other safety devices in place, operable, and used.
2. Type and Quality - The tools and equipment used in a certified program must be of the type and quality found in industry. They must also be adequate and in sufficient quantity to meet the program goals and student performance objectives.
3. Consumable Supplies - Supplies should be in sufficient quantity to assure continuous instruction. Consumable supplies, such as solvents, sand paper, etc. are not listed.
4. Maintenance - A preventive maintenance schedule should be used to minimize equipment down time.
5. Replacement - A systematic schedule for replacement should be used to maintain up-to-date tools and equipment at industry and safety standards. Information gained from student program evaluations as well as advisory committee input should be used in the replacement process.
6. Inventory - An inventory system should be used to account for tools, equipment, parts, and supplies.
7. Parts Purchasing - A systematic parts-purchasing system should be used - from work order to supplier.
8. Hand Tools - Each student should be encouraged to purchase a hand tool set during the period of instruction.
9. Storage - Adequate storage of tools should be provided. Space for storage of the students' hand tools should be provided.

AUTOMOBILE PROGRAM EVALUATION

NATEF Standards for Initial Certification and Recertification are identical. Four items are critical for certification and are in **bold** print in the Automobile Program Self-Evaluation materials. These four items are:

2.5 A	**Does the Advisory Committee convene a minimum of two working meetings per year?**
6.5 A	**Do the [automobile] areas provide theory and "hands-on" training for 95% of the P-1, 80% of the P-2, and 50% of the P-3 tasks [in each area to be certified]?**
7.1 A	**Rate the degree to which all shields, guards, and other safety devices are in place, operable, and used.**
7.1 B	**Rate the degree to which all students, instructors, and visitors wear safety glasses in the lab/shop area while lab is in session.**

Programs must be able to support a yes response for 2.5 A and 6.5 A. Programs must hold at least two working meetings of the Advisory Committee each year (2.5 A). In section 6.5 A, the programs must include the required percentage of the P-1, P-2, and P-3 tasks in the areas where certification is desired. Programs must also achieve at least a 4 on the 5-point scale on items 7.1 A & B. Programs must meet the hour requirements listed on page 5 in the areas identified for certification unless they meet both the requirements listed in item 9 on page 6. **If these responses are not achieved, do not apply for certification at this time.**

In addition, an on-site evaluation will not be scheduled unless the average score on each of Standards 6, 7, 8, and 9 is at least a 4 on the Automobile Program Self-Evaluation. Please refer to the Automobile Program Requirements for more information.

NATEF POLICIES ON ARTICULATION AGREEMENTS FOR ASE PROGRAM CERTIFICATION

In a number of states and localities, technician training programs are able to meet ASE standards for certification only by establishing an articulation effort between secondary and post-secondary programs. NATEF Trustee action, as well as language in the Carl D. Perkins Vocational Education Act, encourages articulation between programs at the secondary and post-secondary levels.

Articulation agreements encourage, but cannot require, graduates of secondary programs to go on to post-secondary education. Financial and social considerations suggest that many, perhaps most, graduates must seek employment upon graduation from high school.

Articulation agreements for Automobile, Collision Repair & Refinish, and Medium/Heavy Truck technician training programs may involve two or more training centers at secondary and post-secondary levels or two programs at the secondary level. However, when programs articulate the following conditions must be met:

1. The minimum ASE specialty areas required in Automobile, Collision Repair & Refinish, and Medium/Heavy Truck technician training programs must be included:

   Automobile: Brakes, Electrical/Electronic Systems, Engine Performance, and Suspension & Steering.

   Medium/Heavy Truck: Diesel Engines, Suspension & Steering, Brakes, Electrical/Electronic Systems, and Preventive Maintenance Inspection.

   Collision Repair & Refinish: Structural Analysis & Damage Repair plus at least two of the following areas:

   Non-Structural Analysis & Damage Repair
   Mechanical & Electrical Components
   Plastics & Adhesives
   Painting & Refinishing

   (Note: A program may be certified in Painting & Refinishing only and would not be required to have an articulation agreement.)

2. Automobile and Medium/Heavy Truck programs must have a minimum of two required specialty areas to articulate with another program for ASE certification purposes.

3. Collision Repair & Refinish programs must have Structural Analysis & Damage Repair and one of the four optional program areas to articulate with another program for ASE certification purposes.

**** IN EVERY CASE A SIGNED COPY OF THE ARTICULATION AGREEMENT MUST BE SUBMITTED WITH THE SELF-EVALUATION MATERIALS. ****

4. The articulation agreement must be in writing and approved by the administration of each institution. The agreement shall:

   a. List the areas of instruction to be offered by each training center.

   b. Stipulate how credit will be granted for successful completion of the instructional areas at each institution. This should also include the criteria for evaluating successful completion.

   c. Describe procedures for applying for credit at the post-secondary level for instruction received at the secondary level.

5. WHEN TWO OR MORE CENTERS ARE TO BE EVALUATED AT THE SAME TIME

   The procedures for submitting the self-evaluation materials and on-site team evaluation application are as follows:

   a. Each training center in an articulation agreement shall conduct a self-evaluation for the specialty areas at their training center. The center requesting the largest number of specialty areas to be certified shall be designated the lead center. If the participating centers are requesting the same number of areas certified, they will select one center as the lead center. The lead center will be responsible for submitting all self-evaluation materials including a cover letter and a signed copy of the articulation agreement.

   b. When two or more centers under an articulation agreement are being evaluated at the same time they shall agree upon the selection of the on-site evaluation team members.

   c. The NATEF office must be informed of the number of training centers and specialty areas being evaluated. The number of centers and areas being evaluated may require additional members or additional days to complete the evaluation.

   d. The division of the local costs involved for the on-site evaluation is to be explained and submitted with the Application for On-Site Evaluation.

   e. The course of study for the articulated centers requesting certification shall be sent by the lead center to the Evaluation Team Leader assigned by NATEF.

6. WHEN ONE CENTER IS ALREADY CERTIFIED

The procedures for submitting the self-evaluation materials and on-site team evaluation application are as follows:

a. When a training center is entering into an articulation agreement with a center that is currently certified, the center that is not certified will submit the self-evaluation materials along with a signed copy of the articulation agreement. The non-certified center will follow through with the total certification process.

b. The on-site evaluation team members will only evaluate the materials at the training center requesting certification.

c. The training center that is already certified will NOT be required to be evaluated until they are due to recertify their training program.

7. Articulated training centers may certify in one or more of the same specialty areas as long as they meet the minimum required areas jointly. For example, one automotive training center (Center A) may be certified in four or more areas, including the minimum required areas. The articulated automotive training center (Center B) may offer only two of the required areas. Center B would be eligible for certification only after articulating with Center A.

8. Each training center in an articulation agreement shall provide their graduates with a certificate identifying successful completion of instructional areas meeting ASE standards.

9. Certification shall be awarded for each articulated program. Each secondary and post-secondary program shall receive a plaque including specialty area plates only for instructional areas certified in their training center.

10. The certified plaque shall indicate the name of the training center and will include "articulated with _____ training center". This will clearly indicate that a training center may be certified in fewer than the required areas only when it articulates with another training center.

RECOGNITION FOR CERTIFICATION

A program approved for certification will receive a plaque that bears the ASE seal and the school's name. Individual plates will be attached to the plaque to identify the areas in which the program is certified. These will also include the expiration date of certification. Any program certified in all eight areas will receive a Master Certification plaque. A statement below the seal will read:

> "THE INSTRUCTION, COURSE OF STUDY, FACILITIES AND EQUIPMENT OF THIS INSTITUTION HAVE BEEN EVALUATED BY THE NATIONAL AUTOMOTIVE TECHNICIANS EDUCATION FOUNDATION AND MEET THE NATIONAL INSTITUTE FOR AUTOMOTIVE SERVICE EXCELLENCE STANDARDS OF QUALITY FOR THE TRAINING OF AUTOMOBILE TECHNICIANS IN THE FOLLOWING AREAS:
>
> _____
>
> _____
>
> _____"

Institutions receiving ASE certification are encouraged to put the following statement on the graduate's diploma or certificate:

> "The person holding this diploma has participated in an automobile technician training program that was certified by the National Institute for Automotive Service Excellence and has completed instruction in the following areas:
>
> _____
>
> _____
>
> _____"

A screened ASE/NATEF logo may be overprinted with the above statement and placed on the graduate's diploma. A camera-ready logo is provided in the promotional materials a program receives upon certification.

A program approved for recertification will receive a plate which reads "RECERTIFIED Exp. 20__".

Certified programs will also receive a 24"x30" sign indicating that the training program is ASE certified.

APPLIED ACADEMICS RECOGNITION

The NATEF Board of Trustees and the ASE Board of Directors has initiated a process to recognize ASE certified programs that are integrating academics and technical skills into the curricula. This effort should be a collaborative effort between the automobile instructors and the academic instructors in language arts, mathematics, and science.

ASE and NATEF will issue a certificate of excellence to those programs that provide documentation including, but not limited to, student assignments or activities, classroom/lab instructional materials, student performance records, and interviews with academic instructors.

Programs that wish to receive recognition must complete the Applied Academics Recognition form and return it with the application for certification or recertification. Documentation on applied academics activities must be available for the ETL at the time of the on-site evaluation.

Programs may receive recognition in Language Arts, Mathematics, Science, or any combination of the three areas.

To receive a copy of the *Applied Academics and Workplace Skills for Automobile Technicians* manual, please contact the NATEF office.

APPEALS AND ACTION FOR REVOCATION

APPEALS: PROGRAMS APPLYING FOR CERTIFICATION

A complaint received from any school concerning the procedures, evaluation or certification of the automobile technician training program must be made in writing to the ASE office in Herndon, VA. It will be immediately referred to the Grievance Examiner who will acknowledge receipt of the complaint in writing to the complainants. Thereafter, the Grievance Examiner will investigate the complaint and prepare a report. A copy of the report will be given to the complainants and to an Appeals Committee within thirty (30) days of the receipt of the complaint.

The Appeals Committee will review the findings and recommendations of the Grievance Examiner, together with the complaint and any data supplied in connection therewith. The Appeals Committee will be empowered to dismiss the matter or to initiate such action as it may deem appropriate.

If the complainants desire to review the Appeals Committee's evaluation, they may do so at the office of the Grievance Examiner in Herndon, VA. However, they will not be permitted to make copies of the results.

ACTION FOR REVOCATION: ASE CERTIFIED PROGRAMS

The Appeals Committee will also advise the ASE President of its judgments and recommendations for action in any cases of malpractice or misrepresentation involving the misuse of ASE certification for an automobile technician training program. Upon receipt of a complaint alleging misuse or misrepresentation by a certified program, the Grievance Examiner will be notified. The Grievance Examiner will notify the parties against whom the complaint has been filed, in writing, indicating the alleged wrongdoing. The parties will be further advised that they may submit a written explanation concerning the circumstances of the complaint within thirty (30) days. After the Grievance Examiner has considered the complaint and received the explanation, if any, the Grievance Examiner will determine whether there is a reasonable basis for a possible wrongdoing. If the Grievance Examiner finds such a basis, the Grievance Examiner will inform the parties of the findings. At that time, the Grievance Examiner will inform the parties of their right to a hearing before the Appeals Committee. The parties will have fifteen (15) days to notify the Grievance Examiner, in writing, of their decision.

In the event the involved parties elect to be bound by the findings of the Grievance Examiner without a hearing, the Grievance Examiner will submit a written report with recommendations to the Chair of the Appeals Committee. This report will be submitted within sixty (60) days of the receipt of the waiver of a hearing. The Chair of the Appeals Committee will mail a copy of the Grievance Examiner's findings and recommendations to the parties. In the event that the involved parties elect to appear at a hearing, the Chair of the Appeals Committee will call a Board of Inquiry. This Board will consist of four ASE Board members, one from each of the

following categories: Education, Public Interest, Service Employers, and Vehicle and Service Products Manufacturers. The Board of Inquiry will be convened in Herndon, VA at a date and time determined by the Chair. The Board will notify the involved parties, in writing, regarding the time and place of the hearing.

The Grievance Examiner will be responsible for investigating and presenting all matters pertinent to the alleged wrongdoing to the Board of Inquiry. The involved parties will be entitled to be at the hearings with or without counsel. The parties will be given an opportunity to present such evidence or testimony as they deem appropriate.

The Board of Inquiry will notify the Chair of the Appeals Committee of its findings and recommendations in writing within ten (10) days after the hearing is completed.

The Appeals Committee will review the findings and recommendations of either the Grievance Examiner if a hearing was waived, or the Board of Inquiry if a hearing was held. The Appeals Committee will determine if the record on the complaint supports a finding of conduct contrary to or in violation of reasonable practices. If two-thirds of the Appeals Committee so find, the Committee will recommend to the President of ASE appropriate sanctions or courses of action against the parties charged.

DEFINITIONS – EDUCATIONAL TERMS

1. CURRICULUM: All the objectives, content, and learning activities arranged in a sequence for a particular instructional area. An orderly arrangement of integrated subjects, activities, time allocations, and experiences which students pursue for the attainment of a specific education goal.

2. COMPETENCY: (Hands On) - Performance of task to the level or degree specified in the performance standard for the task.

3. CRITERION REFERENCED MEASURE(S): An exercise based on a performance objective for a task, and designed to measure attainment of that objective. (Also called performance test(s) or criterion referenced test.)

4. GOAL: A statement of the intended outcome of participation in the training program.

5. LIVE WORK: The processing, assignment and student performance of the appropriate diagnosis, repair, rebuild or replacement tasks on vehicles donated by manufacturers or other sources, customer-owned, and other training vehicles.

6. MASTERY: (See Competency - Hands On).

7. OBJECTIVE, PERFORMANCE: A written statement describing an intended outcome (competent task performance) in terms of student performance. (Also called "behavioral" objective or instructional objective) R.F. Mager Associates, 13245 Rhoda Drive, Los Altos Hill, California.

8. PERSONAL CHARACTERISTIC: Attributes that are not readily measurable, and are generally in the affective or cognitive domains.

9. AREA(S): Relates to one or more of the following: (1) Automatic Transmission/Transaxle, (2) Brakes, (3) Electrical/Electronic Systems, (4) Engine Performance (including emission control systems), (5) Engine Repair, (6) Heating and Air Conditioning, (7) Manual Drive Train and Axles, (8) Suspension and Steering, (9) LPG Diagnosis and Repair, (10) LPG Maintenance, (11) LPG Conversion/Installation, (12) CNG Diagnosis and Repair, (13) CNG Maintenance, and (14) CNG Conversion/Installation.

10. STANDARD: "...Something established for use as a rule or basis of comparison in measuring or judging capacity quantity, content, extent, value, quality, etc." Webster's New World Dictionary (1991)

11. STANDARD - PERFORMANCE: A written specification of the results of acceptable task performance.

12. STANDARD - PERSONAL: An attribute or characteristic of an individual that facilitates entry into and advancement in an occupation.

13. STANDARD - PROGRAM: A specific quality or desired characteristic or a training program designed to prepare individuals for employment.

14. TASK: A task (statement) describes a unit of work activity which has an identifiable beginning and ending point in its accomplishment, and consists of two or more observable steps.

15. TRAINING STATION: An area with appropriate tools and equipment, large enough to allow safety and competency development in task performance.

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Must or shall is an imperative need, duty or requirement: an essential or indispensable item; mandatory.

Should is used to express a recommendation, not mandatory but attainment would increase program quality.

May or could expresses freedom to follow a suggested alternative.

PROCEDURES FOR CERTIFICATION/RECERTIFICATION

Process Overview

NOTE: NATEF recommends that programs maintain a file containing copies of all reference and documentation materials developed during all phases of the certification process.

1. Purchase application materials

The program requesting certification must purchase self-evaluation materials from NATEF in Herndon, VA. To begin the certification process, the program must return the following items from the evaluation materials packet:

a. Application for Certification or Recertification
b. Self-Evaluation Summary Sheet
c. On-site Evaluation Team Member List
d. Instructor Qualifications Forms
e. Advisory Committee List
f. Articulation Agreement (if applicable)
g. Applied Academics Recognition Forms (optional)
h. Facilities Evaluation (CNG/LPG programs only)

2. NATEF review of application

The national office will review the materials within 30 days. Following the review, the Program Administrator and the state Trade & Industrial Supervisor will be notified about the status of the program. The program will be identified as one of the following:

a. Qualified for on-site evaluation for all the specialty areas listed on the application.
b. Qualified for on-site evaluation for some but not all specialty areas listed on the application. The program administrator may proceed with the on-site evaluation for the areas that qualify at that time OR make improvements and resubmit the application at a later date.
c. Not qualified for an on-site evaluation at that time. NATEF will indicate specific improvements that must be made before the on-site evaluation can be scheduled.

3. Evaluation Team Leader (ETL) assigned, Program Coordinator makes contacts

In cooperation with state officials, NATEF will assign an Evaluation Team Leader (ETL) to the program. NATEF will send the program the Application for On-site Evaluation. With a legitimate reason, the Program Coordinator may contact the NATEF office to request a different ETL. (The ETL assigned must NOT be a present or former teacher or administrator of the program to be evaluated.) The Program Coordinator must contact the ETL to arrange a date for the on-site evaluation.

The Application for the On-site Evaluation will be sent with instructions that outline the plans for the local administration and the costs for the ETL's services and expenses. All costs will be paid by the institution requesting certification.

4. Send on-site application, course of study, and list of on-site evaluation team members to ETL

The Application for On-site Evaluation, signed by the program administrator, must be sent to the ETL. A copy of the course of study and this application must be received by the ETL at least two weeks prior to the on-site evaluation or the on-site must be rescheduled. The course of study should include the following items:

a. Syllabus for each class
b. Tasks to be taught under each area, specified according to Priority designations P-1, P-2, P-3. (Tasks may be taught at different times in the program or in more than one area. However, the hours for the tasks may be counted only once.)
c. Number of contact hours for each area
d. Areas and sequence of instruction to be included in the program
e. List of training materials and audio-visual materials used in training
f. Sample evaluation form used to track student progress

The On-site Evaluation Team Member List must be included for the ETL to review and approve. Once a date has been set and the on-site evaluation team members have been approved by the ETL, the program coordinator must contact the on-site evaluation team members to make arrangements for the evaluation day(s).

5. On-site evaluation

Initial certification requires 2 consecutive days while students are in class for the on-site evaluation review of all the standards. However, if more than one program is applying for certification (general automotive and GM ASEP, for example), additional team members and additional days may be required to complete the on-site evaluation. The NATEF office will determine the need for additional team members and days.

Recertification requires a 1-day on-site evaluation while students are in class. The on-site evaluation team reviews Standards 6-9. However, if the Advisory Committee average on Standards 1-5 or Standard 10 is less than 4, the on-site evaluation team must also review these standards. The NATEF office will determine whether an additional day or additional team members will be required to complete the evaluation.

6. ETL reports results to NATEF

The ETL will submit all on-site evaluation materials and a final report to NATEF with a recommendation for or against program certification.

7. Program certification

The national office will review the final report and all additional evaluation materials to determine whether the program meets the requirements for certification and will make their recommendation to the ASE Board. The ASE President will approve certification as sanctioned by the Board of Directors.

Programs that do not earn certification will be given a written report specifying improvements that must be made to qualify for certification. The decision at the national level will be final unless appealed to the ASE Board of Directors. Appeals will be heard only at regular meetings of the Board.

The Program Administrator and the state Trade & Industrial Supervisor will be notified of all decisions regarding the certification status of all programs applying for ASE certification.

8. Display and reporting of certification materials

A wall plaque identifying the certified areas will be forwarded from the national office to the program administrator. Schools **must** accurately report areas of ASE certification.

9. Certified Automobile Technician Training Program List

The NATEF office maintains a current listing of all ASE certified programs. The list is made available upon request.

10. Compliance report

A program will be certified for five years. A compliance report is required after 2½ years. The compliance report will be used to verify that a program is maintaining its standards. NATEF will notify the program administrator of the compliance date and will send the appropriate compliance review forms at that time. The Advisory Committee must complete the report and the program administrator must return the forms to the NATEF office.

NATEF may randomly select programs at the 2½-year period for an on-site compliance review by an ETL and NATEF Trustees, staff, consultants, or other designated representatives. The selected programs will be notified, in advance, of the on-site review by the NATEF office. Programs should be prepared to provide documentation on how they are maintaining the standards. All costs for this on-site review will be paid by NATEF.

11. Recertification

The NATEF office will contact the program six (6) months prior to the certification expiration date. Programs must formally request recertification materials and follow the process outlined above.

On-site Evaluation Cost Sheet

AUTOMOBILE

	CERTIFICATION	RECERTIFICATION
Certification Manuals (Applied Academics general statements and workplace skills list are included)	$60.00	$50.00
On-site Evaluation Team Manuals (minimum of 4 sets for initial cert. and 3 sets for recert. @ $40 each.)	$160.00	$120.00
Honorarium for Evaluation Team Leader (ETL) @ $175/day	$350.00	$175.00
Estimated mileage, hotel, and meal expenses for the ETL	$150.00	$100.00
ESTIMATED TOTAL COSTS	$720.00	$445.00

NOTE: It is anticipated that team members recruited from local independent repair facilities and dealerships will serve without charge to the institution.

*** Costs of certification/recertification are subject to change. Contact the NATEF office for current information.**

AUTOMOBILE PROGRAM STANDARDS

STANDARD 1 - PURPOSE

THE AUTOMOBILE TECHNICIAN TRAINING PROGRAM SHOULD HAVE CLEARLY STATED PROGRAM GOALS, RELATED TO THE NEEDS OF THE STUDENTS AND EMPLOYERS SERVED.

Standard 1.1 - Employment Potential
The employment potential for automobile technicians, trained to the level for the specialty or general areas outlined in the program goals, should exist in the geographic area served by the program.

Standard 1.2 - Program Description/Goals
The written description/goals of the program should be shared with potential students and should include admission requirements, employment potential, area(s) of specialty training offered, and the cost of all tuition and fees. Technical qualifications of the faculty and the overall goal(s) of the program should also be included.

STANDARD 2 - ADMINISTRATION

PROGRAM ADMINISTRATION SHOULD ENSURE THAT INSTRUCTIONAL ACTIVITIES SUPPORT AND PROMOTE THE GOALS OF THE PROGRAM.

Standard 2.1 - Student Competency Certification
The certificate or diploma a student receives upon program completion should clearly specify the area(s) of demonstrated competency.

Standard 2.2 - Chain of Command
An organizational chart should be used to indicate the responsibilities for instruction, administration, and support services.

Standard 2.3 - Administrative Support
Positive administrative support from institutional and local governing bodies should be demonstrated. Indicators of administrative support would include: support for staff in-service training; provision of appropriate facilities; up-to-date tools, equipment, and training support materials.

Standard 2.4 - Written Policies
Written policies should be adopted by the administration and policy board for use in decision-making situations and to provide guidance in achieving the program goals. Policies regarding safety, liability, and lab/shop operation should be written and prominently displayed as well as provided to all students and instructors.

Standard 2.5 - Advisory Committee
An Advisory Committee consisting of at least five (5) members must convene at least two times a year and be utilized to provide counsel, assistance, and information from the community served by the training program. This Committee should be broadly based and include former students, employed technicians, employers, and representatives for consumers' interests.

Standard 2.6 - Public/Community Relations
An organized plan should be used to provide the community at large information regarding the training program, its graduates, its plans, and any services provided to the community.

Standard 2.7 - Live Work
A systematic method of collecting, documenting, and disbursing live work repair receipts should be used. Instructional staff should not be required to collect payment for live work repairs.

STANDARD 3 - LEARNING RESOURCES

SUPPORT MATERIAL CONSISTENT WITH BOTH PROGRAM GOALS AND PERFORMANCE OBJECTIVES SHOULD BE AVAILABLE TO STAFF AND STUDENTS.

Standard 3.1 - Service Information
Service information with current manufacturer's service procedures and specification data for vehicles manufactured within the last ten (10) years should be available. This information should be accessible to students while working in the lab/shop area.

Standard 3.2 - Multimedia
Appropriate up-to-date multimedia materials such as video equipment, transparencies, etc. should be readily available and utilized in the training process.

Standard 3.3 - Instructional Development Services
The service of professional instructional development personnel should be used when available. At a minimum, equipment and supplies should be available for duplication or copying printed materials and transparencies. Instructional development personnel should conduct in-service and/or training in curriculum and media development.

Standard 3.4 - Periodicals
Current general and technical automobile magazines and newspapers should be available for student and instructor use.

Standard 3.5 - Student Materials
Necessary instructional texts or pertinent material should be available for each student to satisfy the objectives of the mode of instruction used. Basic textbooks should have copyright dates that are not over six (6) years old; specialized textbooks should have copyright dates that are not over six (6) years old.

STANDARD 4 - FINANCES

FUNDING SHOULD BE PROVIDED TO MEET THE PROGRAM GOALS AND PERFORMANCE OBJECTIVES.

Standard 4.1 - Program Training Cost
The enrollment in the program or program area should be sufficient to keep the per-student training costs to a realistic figure.

Standard 4.2 - Budget
An adequate annual budget should be developed, allocated, and used for the operation of the program.

Standard 4.3 - Budget Preparation
The budget should be prepared by the institutional administration in conjunction with the program faculty.

Standard 4.4 - Status Reports
Budget status reports should be made available to program staff at least quarterly.

STANDARD 5 - STUDENT SERVICES

SYSTEMATIC PRE-ADMISSION TESTING, INTERVIEWS, COUNSELING SERVICES, PLACEMENT, AND FOLLOW-UP PROCEDURES SHOULD BE USED.

Standard 5.1 - Pretesting
A formal pretesting program should be used to assess a student's abilities in reading, mathematics, and mechanical aptitude to evaluate and assure the student a reasonable probability of success as an automobile technician. Testing procedures and how the test results will be used (e.g., placement, assessment of student's developmental needs, etc.) should be stated in program explanatory material, and justification for all requirements should be available.

Standard 5.2 - Pre-admission Interviews
Prior to program admission, a student should be interviewed and approved for admission.

Standard 5.3 - Student Records
Permanent records of all students, former and current, should be available, preferably in one central location, and kept confidential.

Standard 5.4 - Placement
A systematic student placement system should be used to assist program graduates to obtain employment in the automobile industry.

Standard 5.5 - Follow-up
A follow-up system should be used to determine students' employment location and for feedback regarding the efficiency, effectiveness, and appropriateness of training. The follow-up procedure should be designed to assure feedback regarding needed additions to or deletions from the training curriculum, program, and tools and equipment. Follow-up of graduates employed outside of the automobile industry should indicate reasons for non-automobile employment. When applicable, this information should be used to modify the training quality and/or content.

Standard 5.6 - Legal Requirements
The training program should meet all applicable local, state, and federal requirements.

STANDARD 6 - INSTRUCTION

INSTRUCTION MUST BE SYSTEMATIC AND REFLECT PROGRAM GOALS. A TASK LIST AND SPECIFIC PERFORMANCE OBJECTIVES WITH CRITERION REFERENCED MEASURES MUST BE USED.

Standard 6.1 - Program Plan
The training plan should progress in logical steps, provide for alternate sequences, where applicable, and be made available to each student.

Standard 6.2 - Student Training Plan
A training plan for each student should be used, indicating the student's training goal(s) and specific steps needed to meet that goal. Students should be given a copy of their training plan.

Standard 6.3 - Preparation Time
Adequate time should be provided for teacher preparation and program development.

Standard 6.4 - Teaching Load
The instructor/student ratio and class contact hours should allow time for interaction on a one-to-one basis.

Standard 6.5 - Curriculum
All tasks have been given a priority rating. Ninety-five percent (95%) of the tasks designated as Priority 1 (P-1) must be taught in the curriculum. Eighty percent (80%) of the tasks designated as Priority 2 (P-2) must be taught in the curriculum. Fifty percent (50%) of the tasks designated as Priority 3 (P-3) must be taught in the curriculum. Additional tasks may be included to meet the needs of local employers. All additional tasks should be approved by the Advisory Committee.

Instruction on the legal aspects and responsibilities of the automobile technician in areas such as Environmental Protection Agency regulations, safety regulations, OSHA regulations, and other appropriate requirements should be included in the curriculum. Instruction and practice in filling out work order forms, ordering parts, and basic record keeping should be a part of the training program.

Tools and equipment must be available to perform the tasks in each of the areas for which certification is requested.

Standard 6.6 - Student Progress
A record of each student's progress should be maintained through the use of a progress chart or other recording device. The record should indicate tasks required for mastery in the area and those tasks the student has mastered.

Standard 6.7 - Performance Standards
All instruction should be performance based, with an acceptable performance standard stated for each task. These standards should be shared with students and potential employers. Students should demonstrate "hands-on competency" or "mastery" of a task before the instructor verifies a student's performance.

Standard 6.8 - Safety Standards
Safety instruction should be given prior to lab/shop work and be an integral part of the training program. A safety test should be included in the training program. Students and instructors should comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

Standard 6.9 - Personal Characteristics
All training activities and instructional material should emphasize the importance of maintaining high personal standards.

Standard 6.10 - Work Habits/Ethics
The training program should be organized in such a manner that work habits and ethical practices required on the job are an integral part of the instruction.

Standard 6.11 - Provision for Individual Differences
The training program should be structured in such a manner that students with different levels of cognitive and psychomotor skills can be accommodated.

Standard 6.12 - Related Instruction
Instruction in related mathematics, communication, and interpersonal relations should be provided and coordinated with ongoing instruction in the training program. This instruction should be provided by a qualified instructor.

Standard 6.13 - Testing
Both written and performance based tests should be used to validate student competency. Students should be encouraged to take certification tests that are publicly recognized indicators of capabilities.

Standard 6.14 - Evaluation of Instruction
Instructional procedures should be evaluated in a systematic manner. This evaluation should be through regular reviews by students and the administration. Self-evaluation of instruction should also be utilized on a systematic and regular basis. This system should include input from former students and the Advisory Committee members. Instructional procedures should show a responsiveness to the feedback from these evaluations.

Standard 6.15 - Live Work
Live work should be scheduled to benefit the student and supplement ongoing instruction on items specified in the NATEF task list. A student should have had instruction and practice on a specific repair task before live work requiring that task is assigned. Vehicles donated by the manufacturers or other sources, customer-owned vehicles, and other training vehicles may be used as the primary source of live work. Automobile training program student-owned vehicles, school buses, and other vehicles owned and operated by the governing body of the school should not be the primary source of live work vehicles. All vehicles in the lab/shop should have a completed industry-type work order attached to or on the vehicle.

Standard 6.16 - Articulation
Agreements between programs with equivalent competencies should be used to eliminate unnecessary duplication of instruction.

STANDARD 7 - EQUIPMENT

EQUIPMENT AND TOOLS USED MUST BE OF THE TYPE AND QUALITY FOUND IN THE REPAIR INDUSTRY AND MUST ALSO BE THE TYPE NEEDED TO PROVIDE TRAINING TO MEET THE PROGRAM GOALS AND PERFORMANCE OBJECTIVES.

Standard 7.1 - Safety
Equipment and tools used in the training program must have all shields, guards, and other safety devices in place, operable, and used. Safety glasses must be worn by all students, instructors, and visitors in the lab/shop area while lab is in session.

Standard 7.2 - Quantity and Quality
The tools and equipment used in the training program should reflect the program goals and performance objectives. Sufficient tools and equipment should be available for the training offered. The tools and equipment should meet industry quality standards.

Standard 7.3 - Consumable Supplies
Sufficient consumable supplies should be readily available to assure continuous instruction.

Standard 7.4 - Maintenance
A preventive maintenance schedule should be used to minimize equipment down-time.

Standard 7.5 - Replacement
A systematic schedule for replacement should be used to maintain up-to-date tools and equipment at industry and safety standards. Student follow-up and Advisory Committee input should be used in this system.

Standard 7.6 - Inventory
An inventory system should be used to account for tools, equipment, parts, and supplies.

Standard 7.7 - Parts Purchasing
A systematic parts purchasing system, from work order - to parts specialist - to jobber, should be used. Task performance should not be unreasonably delayed due to lack of replacement parts.

Standard 7.8 - Hand Tools
Each student should have a basic hand tool set comparable to tools required for employment. Students should be encouraged to purchase a hand tool set during the period of instruction, appropriate to the automobile specialty area(s) in which they are receiving training.

STANDARD 8 - FACILITIES

THE PHYSICAL FACILITIES MUST BE ADEQUATE TO PERMIT ACHIEVEMENT OF THE PROGRAM GOALS AND PERFORMANCE OBJECTIVES.

Standard 8.1 - Training Stations
Training stations (bench and live work) should be available in the type and number required for the performance of tasks outlined in the program goals and performance objectives.

Standard 8.2 - Safety
The facilities should meet all applicable safety standards and an emergency plan should be in place and posted in all classrooms and lab/shop areas.

Standard 8.3 - Maintenance
A regular facilities maintenance program should be used to ensure facilities are suitable when required for instruction.

Standard 8.4 - Housekeeping
The classroom(s), lab/shop, and support area(s) should be kept clean and orderly.

Standard 8.5 - Office Space
An area separate from the lab/shop should be available and convenient for the instructor(s) use as an office.

Standard 8.6 - Instructional Area
A classroom convenient to, but separate from, the lab/shop area should be available for instruction and other non-lab/shop activities.

Standard 8.7 - Storage
Storage areas for tools, parts, supplies, and automobiles should be sufficient to support the activities outlined in the program goals and performance objectives. Security should be provided to prevent pilferage and vandalism.

Standard 8.8 - Support Facilities
Restrooms, clean-up areas, and lockers should be provided for both male and female students and should be convenient to the instructional area.

Standard 8.9 - Ventilation
An adequate exhaust fume removal system should be in place and operational. When appropriate, heating and cooling systems should be used to provide sufficient comfort for learning.

Standard 8.10 - First Aid
A first aid kit should be in place and comply with local regulations.

Standard 8.11 - Facility Evaluation
The Advisory Committee should conduct an annual evaluation of the facilities to assure adequacy to meet program goals.

STANDARD 9 - INSTRUCTIONAL STAFF

THE INSTRUCTIONAL STAFF MUST HAVE TECHNICAL COMPETENCY AND MEET ALL STATE AND LOCAL REQUIREMENTS FOR CERTIFICATION.

Standard 9.1 - Technical Competency
Instructors must hold current ASE certification in the automobile areas they teach and which are being evaluated for program certification.

Standard 9.2 - Instructional Competency/Certification
Instructors should meet all state certifying requirements.

Standard 9.3 - Technical Updating
Faculty members should be provided technical materials required to maintain their competency. An opportunity should be provided for instructors to return to industry on a regular basis for in-service and skill upgrading.

Standard 9.4 - First Aid
The program should have a written policy, approved by the administrator of the school, on First Aid procedures.

Standard 9.5 - Substitutes
A systematic method of obtaining "substitute" instructors should be used to assure instructional continuity. An orientation session for substitutes should be held on a regular basis. The substitute should be a competent automobile instructor.

STANDARD 10 - COOPERATIVE AGREEMENTS

WRITTEN POLICIES AND PROCEDURES SHOULD BE USED FOR COOPERATIVE AND APPRENTICESHIP TRAINING PROGRAMS.

Standard 10.1 - Standards
Student performance standards should be developed and coordinated by the supervising instructor.

Standard 10.2 - Agreements
All agreements should be written and legally binding.

Standard 10.3 - Supervision
A supervising automobile instructor should be assigned responsibility, authority, and time to coordinate and monitor cooperative/apprenticeship automobile programs.

TASK LIST AND ASSUMPTIONS

The NATEF task list was reviewed and updated in January 1999. A national committee was assembled in Torrance, California to review the standards used in the automobile certification program. The committee consisted of individuals representing the major automobile manufacturers, automobile repair shop owners and technicians, automobile instructors and trainers, and automobile equipment and parts suppliers.

The committee reviewed the standards, task list, tools and equipment list, program hours, and instructor qualifications. The committee also had the most current National Institute for Automotive Service Excellence (ASE) automobile task lists for reference purposes.

All the tasks are assigned a priority number: P-1, P-2, or P-3. Please refer to the Task List Information in the Policies section for additional information on the requirements for instruction on tasks.

Theory instruction and hands-on performance of all the basic tasks will provide initial training for employment in the automotive service field or further training in any or all of the specialty areas. Competency in the tasks will indicate to employers that the graduate is skilled in that area.

1. It is assumed that:

   * in all areas, appropriate theory, safety, and support instruction will be required for performing each task;
   * the instruction has included identification and use of appropriate tools and testing and measurement equipment required to accomplish certain tasks;
   * the student has received the necessary training to locate and use current reference and training materials from accepted industry publications and resources.

2. It is assumed that:

   * all diagnostic and repair tasks described in this document are to be accomplished in accordance with manufacturer's recommended procedures as published.

3. It is assumed that:

   * individual training programs being evaluated for certification should have written and detailed performance standards for each task covered and taught in the curriculum;
   * learning progress of students will be monitored and evaluated against these performance standards;
   * a system is in place that informs all students of their individual progress through all phases of the training program.

4. It is assumed that:

   * individual courses of study will differ across automobile technician training programs;
   * development of appropriate learning delivery systems and tests which monitor student progress will be the responsibility of the individual training program.

5. It is assumed that:

   * all students will receive instruction in the storage, handling, and use of Hazardous Materials as required in Hazard Communication Title 29, Code of Federal Regulation Part 1910.1200, 'Right to Know Law', and state and local requirements;
   * hazardous and toxic materials will be handled, removed and recycled or disposed of according to federal, state, and local regulations.

DEFINITIONS – TECHNICAL TERMS

ADD - To increase fluid or pressure to the correct level or amount.

ADJUST - To bring components to specified operational settings.

AIR TEST - To use air pressure to determine proper action of components.

ALIGN - To bring to precise alignment or relative position of components.

ANALYZE - To examine the relationship of components of an operation.

ASSEMBLE (REASSEMBLE) - To fit together the components of a device.

BALANCE - To establish correct linear, rotational or weight relationship.

BLEED - To remove air from a closed system.

CHARGE - To bring to "full" state, e.g., battery or air conditioning system.

CHECK - To verify condition by performing an operational or comparative examination.

CLEAN - To rid component of extraneous matter for the purpose of reconditioning, repairing, measuring or reassembling.

DEGLAZE – To restore correct surface finish.

DETERMINE - To establish the procedure to be used to effect the necessary repair.

DETERMINE NECESSARY ACTION – Indicates that the diagnostic routine(s) is the primary emphasis of a task. The student is required to perform the diagnostic steps and communicate the diagnostic outcomes and corrective actions required addressing the concern or problem. The training program determines the communication method (worksheet, test, verbal communication, or other means deemed appropriate) and whether the corrective procedures for these tasks are actually performed.

DIAGNOSE - To locate the root cause or nature of a problem by using the specified procedure.

DISASSEMBLE - To separate a component's parts as a preparation for cleaning, inspection or service.

DISCHARGE - To empty a storage device or system.

DRAIN - To use gravity to empty a container.

EVACUATE - To remove air, fluid or vapor from a closed system by use of a vacuum pump.

FILL (REFILL) - To bring fluid level to specified point or volume.

FIND - To locate a particular problem, e.g., shorts, grounds or opens in an electrical circuit.

FLUSH - To use a fluid to clean an internal system.

HONE - To restore or resize or bore by using rotating cutting stones.

IDENTIFY - To establish the identity of a vehicle or component prior to service; to determine the nature or degree of a problem.

INSPECT - (SEE CHECK)

INSTALL (REINSTALL) - To place a component in its proper position in a system.

JUMP START - To use an auxiliary power supply, i.e., battery, battery charger, etc. to assist a battery to crank an engine.

LEAK TEST - To locate the source of leaks in a component or system.

LISTEN - To use audible clues in the diagnostic process; to hear the customer's description of a problem.

LUBRICATE - To employ the correct procedures and materials in performing the prescribed service.

MEASURE - To compare existing dimensions to specified dimensions by the use of calibrated instruments and gauges.

MOUNT - To attach or place tool or component in proper position.

PERFORM - To accomplish a procedure in accordance with established methods and standards.

PERFORM NECESSARY ACTION – Indicates that the student is to perform the diagnostic routine(s) and perform the corrective action item. Where various scenarios (conditions or situations) are presented in a single task, at least one of the scenarios must be accomplished.

PRESSURE TEST - To use air or fluid pressure to determine the integrity, condition, or operation of a component or system.

PRIORITY RATINGS – Indicates the minimum percentage of tasks, by area, a program must include in its curriculum in order to be certified in that area.

PURGE - To eliminate an undesired air or fluid from a closed system.

READY - To prepare a system or component for service, installation or operation.

REASSEMBLE - (SEE ASSEMBLE)

REFILL - (SEE FILL)

REMOVE - To disconnect and separate a component from a system.

REPAIR - To restore a malfunctioning component or system to operating condition.

REPLACE - To exchange an unserviceable component with a new or rebuilt component; to reinstall a component.

RESET (SEE SET)

SELECT - To choose the correct part or setting during assembly or adjustment.

SERVICE - To perform a specified procedure when called for in the owner's or service manual.

SET – To adjust a variable component to a given, usually initial, specification.

TEST - To verify condition through the use of meters, gauges or instruments.

TRIM - (SEE ADJUST)

TORQUE- To tighten a fastener to specified degree or tightness (in a given order or pattern if multiple fasteners are involved on a single component).

VACUUM TEST - To determine the integrity and operation of a vacuum (negative pressure) operated component and/or system.

VERIFY - To establish that a problem exists after hearing the customer's complaint and performing a preliminary diagnosis.

NATEF TASK LIST

ENGINE REPAIR

For every task in Engine Repair, the following safety requirement must be strictly enforced:

Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

I. ENGINE REPAIR

A. General Engine Diagnosis; Removal and Reinstallation (R & R)

1.	Verify and interpret engine concern; determine necessary action.	P-1
2.	Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action.	P-2
3.	Diagnose engine noises and vibrations; determine necessary action.	P-3
4.	Diagnose the cause of excessive oil consumption, unusual engine exhaust color, odor, and sound; determine necessary action.	P-3
5.	Perform engine vacuum tests; determine necessary action.	P-1
6.	Perform cylinder power balance tests; determine necessary action.	P-1
7.	Perform cylinder compression tests; determine necessary action.	P-1
8.	Perform cylinder leakage tests; determine necessary action.	P-1
9.	Remove engine (front-wheel drive); prepare for disassembly.	P-3
10.	Reinstall engine (front-wheel drive).	P-3
11.	Remove engine (rear-wheel drive); prepare for disassembly.	P-3
12.	Reinstall engine (rear-wheel drive).	P-3

I. ENGINE REPAIR

B. Cylinder Head and Valve Train Diagnosis and Repair

1.	Remove cylinder head(s); visually inspect cylinder head(s) for cracks; check gasket surface areas for warpage and leakage; check passage condition.	P-2
2.	Install cylinder heads and gaskets; tighten according to manufacturer's specifications and procedures.	P-2
3.	Inspect and test valve springs for squareness, pressure, and free height comparison; replace as needed.	P-3
4.	Inspect valve spring retainers, locks, and valve grooves.	P-2
5.	Replace valve stem seals.	P-3
6.	Inspect valve guides for wear; check valve guide height and stem-to-guide clearance; recondition or replace as needed.	P-3
7.	Resurface valves; perform necessary action.	P-2
8.	Resurface valve seats; perform necessary action.	P-2
9.	Check valve face-to-seat contact and valve seat concentricity (runout); service seats and valves as needed.	P-3
10.	Check valve spring assembled height and valve stem height; service valve and spring assemblies as needed.	P-2
11.	Inspect pushrods, rocker arms, rocker arm pivots and shafts for wear, bending, cracks, looseness, and blocked oil passages (orifices); perform necessary action.	P-2
12.	Inspect hydraulic or mechanical lifters; replace as needed.	P-2
13.	Adjust valves (mechanical or hydraulic lifters).	P-1
14.	Inspect camshaft drives (including gear wear and backlash, sprocket and chain wear); replace as necessary.	P-2
15.	Inspect and replace timing belt(s), overhead camdrive sprockets, and tensioners; check belt tension; adjust as necessary.	P-1

16.	Inspect camshaft for runout, journal wear and lobe wear.	P-3
17.	Inspect and measure camshaft bearings for wear, damage, out-of-round, and alignment; determine necessary action.	P-3
18.	Verify camshaft(s) timing according to manufacturer's specifications and procedure.	P-1

I. ENGINE REPAIR

C. Engine Block Assembly Diagnosis and Repair

1.	Inspect and replace pans, covers, gaskets, and seals.	P-2
2.	Inspect engine block for visible cracks, passage condition, core and gallery plug condition, and surface warpage; determine necessary action.	P-2
3.	Inspect internal and external threads; restore as needed (includes installing thread inserts).	P-1
4.	Remove cylinder wall ridges.	P-3
5.	Inspect and measure cylinder walls for damage and wear; determine necessary action.	P-2
6.	Deglaze and clean cylinder walls.	P-1
7.	Inspect and measure camshaft bearings for wear, damage, out-of-round, and alignment; determine necessary action.	P-3
8.	Inspect crankshaft for surface cracks and journal damage; check oil passage condition; measure journal wear; determine necessary action.	P-3
9.	Inspect and measure main and connecting rod bearings for damage, clearance, and end play; determine necessary action (includes the proper selection of bearings).	P-2
10.	Identify piston and bearing wear patterns that indicate connecting rod alignment and main bearing bore problems; inspect rod alignment and bearing bore condition.	P-3
11.	Inspect, measure, and service pistons and pins; determine necessary action.	P-2

12.	Inspect, measure, and install piston rings.	P-2
13.	Inspect, repair or replace crankshaft vibration damper (harmonic balancer).	P-3
14.	Reassemble engine components using correct gaskets and sealants.	P-2
15.	Inspect auxiliary (balance, intermediate, idler, counterbalance or silencer) shaft(s); inspect shaft(s) and support bearings for damage and wear; determine necessary action; reinstall and time.	P-3
16.	Prime engine lubrication system.	P-1

I. ENGINE REPAIR

D. Lubrication and Cooling Systems Diagnosis and Repair

1.	Perform oil pressure tests; determine necessary action.	P-1
2.	Inspect oil pump gears or rotors, housing, pressure relief devices, and pump drive; perform necessary action.	P-3
3.	Perform cooling system, cap, and recovery system tests (pressure, combustion leakage, and temperature); determine necessary action.	P-1
4.	Inspect, replace, and adjust drive belts, tensioners, and pulleys.	P-1
5.	Inspect and replace engine cooling and heater system hoses.	P-2
6.	Inspect, test, and replace thermostat and housing.	P-2
7.	Test coolant; drain and recover coolant; flush and refill cooling system with recommended coolant; bleed air as required.	P-1
8.	Inspect, test, remove, and replace water pump.	P-2
9.	Remove and replace radiator.	P-2
10.	Inspect, and test fans(s) (electrical or mechanical), fan clutch, fan shroud, and air dams.	P-2
11.	Inspect auxiliary oil coolers; replace as needed.	P-3

12.	Inspect, test, and replace oil temperature and pressure switches and sensors.	P-2
13.	Perform oil and filter change.	P-1

AUTOMATIC TRANSMISSION AND TRANSAXLE

For every task in Automatic Transmission and Transaxle, the following safety requirement must be strictly enforced:

Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

II. AUTOMATIC TRANSMISSION AND TRANSAXLE

A. General Transmission and Transaxle Diagnosis

1.	Identify and interpret transmission concern; assure proper engine operation; determine necessary action.	P-1
2.	Diagnose unusual fluid usage, level, and condition concerns; determine necessary action.	P-1
3.	Perform pressure tests; determine necessary action.	P-1
4.	Perform lock-up converter system tests; determine necessary action.	P-2
5.	Diagnose electronic, mechanical, hydraulic, vacuum control system concerns; determine necessary action.	P-1
6.	Diagnose noise and vibration concerns; determine necessary action.	P-3

II. AUTOMATIC TRANSMISSION AND TRANSAXLE

B. Transmission and Transaxle Maintenance and Adjustment

1.	Inspect, adjust or replace throttle (TV) linkages or cables, check gear select indicator (as applicable).	P-1
2.	Service transmission; perform visual inspection; replace fluids and filters.	P-1

II. AUTOMATIC TRANSMISSION AND TRANSAXLE

C. In-Vehicle Transmission and Transaxle Repair

1.	Inspect, adjust or replace (as applicable) vacuum modulator; inspect and repair or replace lines and hoses.	P-3
2.	Inspect, repair, and replace governor assembly.	P-3
3.	Inspect and replace external seals and gaskets.	P-2
4.	Inspect extension housing, bushings and seals; perform necessary action.	P-3
5.	Inspect, leak test, flush, and replace cooler, lines, and fittings.	P-1
6.	Inspect and replace speedometer drive gear, driven gear, vehicle speed sensor (VSS), and retainers.	P-3
7.	Inspect and test, adjust, repair or replace transmission related electrical and electronic components (includes computers, solenoids, sensors, relays, switches, and harnesses).	P-1
8.	Inspect, replace, and align powertrain mounts.	P-3

II. AUTOMATIC TRANSMISSION AND TRANSAXLE

D. Off-Vehicle Transmission and Transaxle Repair

1. Removal, Disassembly, and Reinstallation

1.	Remove and reinstall transmission and torque converter (rear-wheel drive).	P-2
2.	Remove and reinstall transaxle and torque converter assembly.	P-2
3.	Disassemble, clean, and inspect transmission/transaxle.	P-1
4.	Inspect, measure, clean, and replace valve body (includes surfaces and bores, springs, valves, sleeves, retainers, brackets, check-balls, screens, spacers, and gaskets), and torque valve body bolts.	P-2
5.	Inspect servo bore, piston, seals, pin, spring, and retainers; determine necessary action.	P-3

6.	Inspect accumulator bore, piston, seals, spring, and retainer; determine necessary action.	P-3
7.	Assemble transmission/transaxle.	P-1

2. Oil Pump and Converter

1.	Inspect converter flex plate, attaching parts, pilot, pump drive, and seal areas.	P-2
2.	Measure torque converter endplay and check for interference; check stator clutch.	P-2
3.	Inspect, measure, and replace oil pump assembly and components.	P-3
4.	Check torque converter and transmission cooling system for contamination.	P-1

3. Gear Train, Shafts, Bushings and Case

1.	Measure endplay or preload; determine necessary action.	P-1
2.	Inspect, measure, and replace thrust washers and bearings.	P-2
3.	Inspect oil delivery seal rings, ring grooves, and sealing surface areas.	P-2
4.	Inspect bushings; replace as needed.	P-2
5.	Inspect and measure planetary gear assembly (includes sun, ring gear, thrust washers, planetary gears, and carrier assembly); replace as needed.	P-2
6.	Inspect case bores, passages, bushings, vents, and mating surfaces; determine necessary action.	P-2
7.	Inspect transaxle drive, link chains, sprockets, gears, bearings, and bushings; perform necessary action.	P-2
8.	Inspect, measure, repair, adjust or replace transaxle final drive components.	P-2
9.	Inspect and reinstall parking pawl, shaft, spring, and retainer; determine necessary action.	P-3

4. Friction and Reaction Units

1.	Inspect clutch drum, piston, check-balls, springs, retainers, seals, and friction and pressure plates; replace as needed.	P-2
2.	Measure clutch pack clearance; adjust as needed.	P-1
3.	Air test operation of clutch and servo assemblies.	P-1
4.	Inspect roller and sprag clutch, races, rollers, sprags, springs, cages, and retainers; replace as needed.	P-2
5.	Inspect bands and drums; adjust or replace as needed.	P-3

MANUAL DRIVE TRAIN AND AXLES

For every task in Manual Drive Train and Axles, the following safety requirement must be strictly enforced:

Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

III. MANUAL DRIVE TRAIN AND AXLES

A. Clutch Diagnosis and Repair

1.	Diagnose clutch noise, binding, slippage, pulsation, and chatter; determine necessary action.	P-1
2.	Inspect clutch pedal linkage, cables, automatic adjuster mechanisms, brackets, bushings, pivots, and springs; perform necessary action.	P-1
3.	Inspect hydraulic clutch slave and master cylinders, lines, and hoses; perform necessary action.	P-1
4.	Inspect release (throw-out) bearing, lever, and pivot; perform necessary action.	P-1
5.	Inspect and replace clutch pressure plate assembly and clutch disc.	P-1

6.	Inspect, remove or replace crankshaft pilot bearing or bushing (as applicable).	P-1
7.	Inspect flywheel and ring gear for wear and cracks, measure runout; determine necessary action.	P-1
8.	Inspect engine block, clutch (bell) housing, and transmission/transaxle case mating surfaces; determine necessary action.	P-3
9.	Measure flywheel-to-block runout and crankshaft endplay; determine necessary action.	P-3

III. MANUAL DRIVE TRAIN AND AXLES

B. Transmission/Transaxle Diagnosis and Repair

1.	Remove and reinstall transmission/transaxle.	P-2
2.	Disassemble, clean, and reassemble transmission/transaxle components.	P-2
3.	Inspect transmission/transaxle case, extension housing, case mating surfaces, bores, bushings, and vents; perform necessary action.	P-3
4.	Diagnose noise, hard shifting, jumping out of gear, and fluid leakage concerns; determine necessary action.	P-3
5.	Inspect, adjust, and reinstall shift linkages, brackets, bushings, cables, pivots, and levers.	P-3
6.	Inspect and reinstall powertrain mounts.	P-3
7.	Inspect and replace gaskets, seals, and sealants; inspect sealing surfaces.	P-2
8.	Remove and replace transaxle final drive.	P-3
9.	Inspect, adjust, and reinstall shift cover, forks, levers, grommets, shafts, sleeves, detent mechanism, interlocks, and springs.	P-2
10.	Measure endplay or preload (shim or spacer selection procedure) on transmission/transaxle shafts; perform necessary action.	P-1
11.	Inspect and reinstall synchronizer hub, sleeve, keys (inserts), springs, and blocking rings.	P-2

12.	Inspect and reinstall speedometer drive gear, driven gear, vehicle speed sensor (VSS), and retainers.	P-2
13.	Diagnose transaxle final drive assembly noise and vibration concerns; determine necessary action.	P-3
14.	Remove, inspect, measure, adjust, and reinstall transaxle final drive pinion gears (spiders), shaft, side gears, side bearings, thrust washers, and case assembly.	P-2
15.	Inspect lubrication devices (oil pump or slingers); perform necessary action.	P-3
16.	Inspect, test, and replace transmission/transaxle sensors and switches.	P-1

III. MANUAL DRIVE TRAIN AND AXLES

C. Drive Shaft and Half Shaft, Universal and Constant-Velocity (CV) Joint Diagnosis and Repair

1.	Diagnose constant-velocity (CV) joint noise and vibration concerns; determine necessary action.	P-2
2.	Diagnose universal joint noise and vibration concerns; perform necessary action.	P-2
3.	Replace front wheel drive (FWD) front wheel bearing.	P-2
4.	Inspect, service, and replace shafts, yokes, boots, and CV joints.	P-1
5.	Inspect, service, and replace shaft center support bearings.	P-3
6.	Check shaft balance; measure shaft runout; measure and adjust driveline angles.	P-3

III. MANUAL DRIVE TRAIN AND AXLES

D. Drive Axle Diagnosis and Repair

1. Ring and Pinion Gears and Differential Case Assembly

1.	Diagnose noise and vibration concerns; determine necessary action.	P-2
2.	Diagnose fluid leakage concerns; determine necessary action.	P-2

3.	Inspect and replace companion flange and pinion seal; measure companion flange runout.	P-2
4.	Inspect ring gear and measure runout; determine necessary action.	P-2
5.	Remove, inspect, and reinstall drive pinion and ring gear, spacers, sleeves, and bearings.	P-2
6.	Measure and adjust drive pinion depth.	P-2
7.	Measure and adjust drive pinion bearing preload.	P-1
8.	Measure and adjust side bearing preload and ring and pinion gear total backlash and backlash variation on a differential carrier assembly (threaded cup or shim types).	P-2
9.	Check ring and pinion tooth contact patterns; perform necessary action.	P-1
10.	Disassemble, inspect, measure, and adjust or replace differential pinion gears (spiders), shaft, side gears, side bearings, thrust washers, and case.	P-2
11.	Reassemble and reinstall differential case assembly; measure runout; determine necessary action.	P-2

2. Limited Slip Differential

1.	Diagnose noise, slippage, and chatter concerns; determine necessary action.	P-3
2.	Inspect and flush differential housing; refill with correct lubricant.	P-2
3.	Inspect and reinstall clutch (cone or plate) components.	P-3
4.	Measure rotating torque; determine necessary action.	P-3

3. Drive Axle Shaft

1.	Diagnose drive axle shafts, bearings, and seals for noise, vibration, and fluid leakage concerns; determine necessary action.	P-2
2.	Inspect and replace drive axle shaft wheel studs.	P-3
3.	Remove and replace drive axle shafts.	P-1

4.	Inspect and replace drive axle shaft seals, bearings, and retainers.	P-2
5.	Measure drive axle flange runout and shaft endplay; determine necessary action.	P-2

III. MANUAL DRIVE TRAIN AND AXLES

E. Four-wheel Drive/All-wheel Drive Component Diagnosis and Repair

1.	Diagnose noise, vibration, and unusual steering concerns; determine necessary action.	P-3
2.	Inspect, adjust, and repair shifting controls (mechanical, electrical, and vacuum), bushings, mounts, levers, and brackets.	P-3
3.	Remove and reinstall transfer case.	P-3
4.	Disassemble, service, and reassemble transfer case and components.	P-3
5.	Inspect front-wheel bearings and locking hubs; perform necessary action.	P-3
6.	Check drive assembly seals and vents; check lube level.	P-3
7.	Diagnose test, adjust, and replace electrical/electronic components of four-wheel drive systems.	P-3

SUSPENSION AND STEERING

For every task in Suspension and Steering, the following safety requirement must be strictly enforced:

Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

IV. SUSPENSION AND STEERING

A. Steering Systems Diagnosis and Repair

1.	Disable and enable supplemental restraint system (SRS) in accordance with manufacturer's procedures.	P-1
2.	Remove and replace steering wheel; center/time supplemental restraint system (SRS) coil in accordance with manufacturer's procedures.	P-1
3.	Diagnose steering column noises, looseness, and binding concerns (including tilt mechanisms); determine necessary action.	P-3
4.	Diagnose power steering gear (non-rack and pinion) binding, uneven turning effort, looseness, hard steering, and fluid leakage concerns; determine necessary action.	P-3
5.	Diagnose power steering gear (rack and pinion) binding, uneven turning effort, looseness, hard steering, and fluid leakage concerns; determine necessary action.	P-3
6.	Inspect steering shaft universal-joint(s), flexible coupling(s), collapsible column, lock cylinder mechanism, and steering wheel; perform necessary action.	P-2
7.	Adjust manual or power non-rack and pinion worm bearing preload and sector lash.	P-3
8.	Remove and replace manual or power rack and pinion steering gear; inspect mounting bushings and brackets.	P-2
9.	Disassemble, inspect, perform necessary action and reassemble rack and pinion steering gear.	P-3
10.	Adjust manual or power rack and pinion steering gear.	P-3
11.	Inspect and replace manual or power rack and pinion steering gear inner tie rod ends (sockets) and bellows boots.	P-2
12.	Inspect power steering fluid levels and condition.	P-1
13.	Flush, fill, and bleed power steering system.	P-2
14.	Diagnose power steering fluid leakage; determine necessary action.	P-2

15.	Remove, inspect, replace, and adjust power steering pump belt.	P-1
16.	Remove, inspect, and replace power steering pump, mounts, seals, and gaskets.	P-3
17.	Remove, inspect, and replace power steering pump pulley; check alignment.	P-3
18.	Inspect and replace power steering hoses and fittings.	P-2
19.	Inspect and replace pitman arm, relay (centerlink/intermediate) rod, idler arm and mountings, and steering linkage damper.	P-3
20.	Inspect, replace, and adjust tie rod ends (sockets), tie rod sleeves, and clamps.	P-2
21.	Diagnose and adjust components of electronically controlled steering systems; determine necessary action.	P-3

IV. SUSPENSION AND STEERING

B. Suspension Systems Diagnosis and Repair

1. Front Suspension

1.	Diagnose short and long arm suspension system noises, body sway, and uneven riding height concerns; determine necessary action.	P-1
2.	Diagnose MacPherson strut suspension system noises, body sway, and uneven riding height concerns; determine necessary action.	P-1
3.	Remove, inspect, and install upper and lower control arms, bushings, shafts, and rebound bumpers.	P-2
4.	Remove, inspect, install, and adjust strut (compression/tension) rods and bushings.	P-2
5.	Remove, inspect, and install upper and lower ball joints on short and long arm suspension systems.	P-2
6.	Remove, inspect, and install steering knuckle assemblies.	P-2
7.	Remove, inspect, and install short and long arm suspension system coil springs and spring insulators.	P-2

8.	Remove, inspect, install, and adjust suspension system torsion bars; inspect mounts.	P-3
9.	Remove, inspect, and install stabilizer bar bushings, brackets, and links.	P-3
10.	Remove, inspect, and install MacPherson strut cartridge or assembly, strut coil spring, insulators (silencers), and upper strut bearing mount.	P-1
11.	Lubricate suspension and steering systems.	P-2

2. Rear Suspension

1.	Remove, inspect, and install coil springs and spring insulators.	P-2
2.	Remove, inspect, and install transverse links, control arms, bushings, and mounts.	P-2
3.	Remove, inspect, and install leaf springs, leaf spring insulators (silencers), shackles, brackets, bushings, and mounts.	P-3
4.	Remove, inspect, and install MacPherson strut cartridge or assembly, strut coil spring, and insulators (silencers).	P-2

3. Miscellaneous Service

1.	Inspect, remove, and replace shock absorbers.	P-1
2.	Remove, inspect, and service or replace front and rear wheel bearings.	P-1
3.	Diagnose, inspect, adjust, repair or replace components of electronically controlled suspension systems.	P-2

IV. SUSPENSION AND STEERING

C. Wheel Alignment Diagnosis, Adjustment, and Repair

1.	Diagnose vehicle wander, drift, pull, hard steering, bump steer, memory steer, torque steer, and steering return concerns; determine necessary action.	P-1
2.	Perform prealignment inspection; perform necessary action.	P-1
3.	Measure vehicle riding height; determine necessary action.	P-1

4.	Check and adjust front and rear wheel camber; perform necessary action.	P-1
5.	Check and adjust caster; perform necessary action.	P-1
6.	Check and adjust front wheel toe; adjust as needed.	P-1
7.	Center steering wheel.	P-1
8.	Check toe-out-on-turns (turning radius); determine necessary action.	P-2
9.	Check SAI (steering axis inclination) and included angle; determine necessary action	P-2
10.	Check and adjust rear wheel toe.	P-2
11.	Check rear wheel thrust angle; determine necessary action.	P-2
12.	Check for front wheel setback; determine necessary action.	P-2
13.	Check front cradle (subframe) alignment; determine necessary action.	P-3

IV. SUSPENSION AND STEERING

D. Wheel and Tire Diagnosis and Repair

1.	Diagnose tire wear patterns; determine necessary action.	P-1
2.	Inspect tires; check and adjust air pressure.	P-1
3.	Diagnose wheel/tire vibration, shimmy, and noise; determine necessary action.	P-2
4.	Rotate tires according to manufacturer's recommendations.	P-1
5.	Measure wheel, tire, axle, and hub runout; determine necessary action.	P-2
6.	Diagnose tire pull (lead) problem; determine necessary action.	P-2
7.	Balance wheel and tire assembly (static and dynamic).	P-1
8.	Dismount, inspect, repair, and remount tire on wheel.	P-2
9.	Reinstall wheel; torque lug nuts.	P-1

BRAKES

For every task in Brakes, the following safety requirement must be strictly enforced:

Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

V. BRAKES

A. Hydraulic System Diagnosis and Repair

1.	Measure and adjust pedal height.	P-2
2.	Check master cylinder for internal and external leaks and proper operation; determine necessary action.	P-2
3.	Remove, bench bleed, and reinstall master cylinder.	P-1
4.	Diagnose poor stopping, pulling or dragging concerns caused by problems in the hydraulic system; determine necessary action.	P-1
5.	Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging or wear; tighten loose fittings and supports; determine necessary action.	P-2
6.	Fabricate and install brake lines (double flare and ISO types); replace hoses, fittings, and supports as needed.	P-2
7.	Select, handle, store, and install brake fluids to proper level.	P-1
8.	Inspect, test, and replace metering (hold-off), proportioning (balance), pressure differential, and combination valves.	P-3
9.	Inspect, test, replace, and adjust height (load) sensing proportioning valve.	P-3
10.	Inspect, test, and replace components of brake warning light system.	P-3
11.	Bleed (manual, pressure, vacuum or surge) brake system.	P-1
12.	Flush hydraulic system.	P-3

V. BRAKES

B. Drum Brake Diagnosis and Repair

1.	Diagnose poor stopping, noise, pulling, grabbing, dragging or pedal pulsation concerns; determine necessary action.	P-1
2.	Remove, clean (using proper safety procedures), inspect, and measure brake drums; service or replace as needed.	P-1
3.	Mount brake drum on lathe; machine braking surface.	P-2
4.	Remove, clean, and inspect brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble.	P-2
5.	Remove, inspect, and install wheel cylinders.	P-2
6.	Pre-adjust brake shoes and parking brake before installing brake drums or drum/hub assemblies and wheel bearings.	P-1
7.	Install wheel, torque lug nuts, and make final checks and adjustments.	P-1

V. BRAKES

C. Disc Brake Diagnosis and Repair

1.	Diagnose poor stopping, noise, pulling, grabbing, dragging or pedal pulsation concerns; determine necessary action.	P-1
2.	Remove caliper assembly from mountings; clean and inspect for leaks and damage to caliper housing; determine necessary action.	P-1
3.	Clean and inspect caliper mounting and slides for wear and damage; determine necessary action.	P-1
4.	Remove, clean, and inspect pads and retaining hardware; determine necessary action.	P-1
5.	Disassemble and clean caliper assembly; inspect parts for wear, rust, scoring, and damage; replace seal, boot, and damaged or worn parts.	P-1
6.	Reassemble, lubricate, and reinstall caliper, pads, and related hardware; seat pads, and inspect for leaks.	P-1

7.	Clean, inspect, and measure rotor with a dial indicator and a micrometer; follow manufacturer's recommendations in determining need to machine or replace.	P-1
8.	Refinish rotor according to manufacturer's recommendations.	P-1
9.	Adjust calipers with integrated parking brake system.	P-3
10.	Install wheel, torque lug nuts, and make final checks and adjustments.	P-1
11.	Remove and replace rotor.	P-2

V. BRAKES

D. Power Assist Units Diagnosis and Repair

1.	Test pedal free travel with and without engine running; check power assist operation.	P-2
2.	Check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster.	P-2
3.	Inspect the vacuum-type power booster unit for vacuum leaks; inspect the check valve for proper operation; determine necessary action.	P-2
4.	Inspect and test hydro-boost system and accumulator for leaks and proper operation; determine necessary action.	P-3

V. BRAKES

E. Miscellaneous (Wheel Bearings, Parking Brakes, Electrical, Etc.) Diagnosis and Repair

1.	Diagnose wheel bearing noises, wheel shimmy, and vibration concerns; determine necessary action.	P-1
2.	Remove, clean, inspect, repack, and install wheel bearings and replace seals; install hub and adjust wheel bearings.	P-1
3.	Check parking brake cables and components for wear, rusting, binding, and corrosion; clean, lubricate, and replace as needed.	P-2
4.	Check parking brake operation; adjust as needed.	P-1

5.	Check operation of parking brake indicator light system.	P-3
6.	Check operation of brake stop light system; adjust and service as needed.	P-1
7.	Replace wheel bearing and race.	P-1

V. BRAKES

F. Anti-lock Brake System

1.	Inspect and test anti-lock brake system (ABS) components; determine necessary action.	P-2
2.	Diagnose poor stopping, wheel lock-up, abnormal pedal feel or pulsation, and noise concerns caused by the anti-lock brake system (ABS); determine necessary action.	P-2
3.	Diagnose anti-lock brake system (ABS) electronic control(s) and components using self-diagnosis and/or recommended test equipment; determine necessary action.	P-1
4.	Depressurize high-pressure components of the anti-lock brake system (ABS).	P-2
5.	Bleed the anti-lock brake system's (ABS) front and rear hydraulic circuits.	P-2
6.	Remove and install anti-lock brake system (ABS) electrical/electronic and hydraulic components.	P-3
7.	Service, test, and adjust anti-lock brake system (ABS) speed sensors.	P-2
8.	Diagnose anti-lock brake system (ABS) braking concerns caused by vehicle modifications (tire size, curb height, final drive ratio, etc.).	P-3

ELECTRICAL/ELECTRONIC SYSTEMS

For every task in Electrical/Electronic Systems, the following safety requirement must be strictly enforced:

Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

VI. ELECTRICAL/ELECTRONIC SYSTEMS

A. General Electrical System Diagnosis

1.	Use wiring diagrams during diagnosis of electrical circuit problems.	P-1
2.	Check electrical circuits with a test light; determine necessary action.	P-2
3.	Check voltage and voltage drop in electrical/electronic circuits using a digital multimeter (DMM); determine necessary action.	P-1
4.	Check current flow in electrical/electronic circuits and components using an ammeter; determine necessary action.	P-1
5.	Check continuity and resistances in electrical/electronic circuits and components with an ohmmeter; determine necessary action.	P-1
6.	Check electrical circuits using jumper wires; determine necessary action.	P-2
7.	Locate shorts, grounds, opens, and resistance problems in electrical/electronic circuits; determine necessary action.	P-1
8.	Measure and diagnose the cause(s) of abnormal key-off battery drain; determine necessary action.	P-1
9.	Inspect and test fusible links, circuit breakers, and fuses; determine necessary action.	P-1
10.	Inspect and test switches, connectors, relays, and wires of electrical/electronic circuits; perform necessary action.	P-1
11.	Repair wiring harnesses and connectors.	P-1
12.	Perform solder repair of electrical wiring.	P-1

VI. ELECTRICAL/ELECTRONIC SYSTEMS

B. Battery Diagnosis and Service

1.	Perform battery state-of-charge test; determine needed service.	P-1
2.	Perform battery capacity test; determine needed service.	P-1
3.	Maintain or restore electronic memory functions.	P-2
4.	Inspect, clean, fill, and replace battery.	P-2
5.	Perform slow/fast battery charge.	P-2
6.	Inspect and clean battery cables, connectors, clamps, and hold-downs; repair or replace as needed.	P-1
7.	Start a vehicle using jumper cables and a battery or auxiliary power supply according to manufacturers recommended specifications.	P-1

VI. ELECTRICAL/ELECTRONIC SYSTEMS

C. Starting System Diagnosis and Repair

1.	Perform starter current draw tests; determine necessary action.	P-1
2.	Perform starter circuit voltage drop tests; determine necessary action.	P-1
3.	Inspect and test starter relays and solenoids; replace as needed.	P-2
4.	Remove and install starter.	P-2
5.	Perform starter bench tests; determine necessary action.	P-3
6.	Inspect and test switches, connectors, and wires of starter control circuits; perform necessary action.	P-2
7.	Disassemble, clean, inspect, and test starter components; replace as needed.	P-3

VI. ELECTRICAL/ELECTRONIC SYSTEMS

D. Charging System Diagnosis and Repair

1.	Perform charging system output test; determine necessary action.	P-1

2.	Diagnose charging system for the cause of undercharge, no-charge, and overcharge conditions.	P-1
3.	Inspect and adjust generator (alternator) drive belts; replace as needed.	P-1
4.	Inspect and test voltage regulator/regulating circuit; perform necessary action.	P-2
5.	Remove, inspect, and install generator (alternator).	P-2
6.	Disassemble generator (alternator), clean, inspect, and test components; determine necessary action.	P-3
7.	Perform charging circuit voltage drop tests; determine necessary action.	P-1

VI. ELECTRICAL/ELECTRONIC SYSTEMS

E. Lighting Systems Diagnosis and Repair

1.	Diagnose the cause of brighter than normal, intermittent, dim, or no light operation; determine necessary action.	P-2
2.	Inspect, replace, and aim headlights and bulbs.	P-2
3.	Inspect and diagnose incorrect turn signal or hazard light operation; perform necessary action	P-2

VI. ELECTRICAL/ELECTRONIC SYSTEMS

F. Gauges, Warning Devices, and Driver Information Systems Diagnosis and Repair

1.	Inspect and test gauges and gauge sending units for cause of intermittent, high, low, or no gauge readings; determine necessary action.	P-2
2.	Inspect and test connectors, wires, and printed circuit boards of gauge circuits; determine necessary action.	P-3
3.	Diagnose the cause of incorrect operation of warning devices and other driver information systems; determine necessary action.	P-1
4.	Inspect and test sensors, connectors, and wires of electronic instrument circuits; determine necessary action.	P-3

VI. ELECTRICAL/ELECTRONIC SYSTEMS

G. Horn and Wiper/Washer Diagnosis and Repair

1.	Diagnose incorrect horn operation; perform necessary action.	P-3
2.	Diagnose incorrect wiper operation; diagnose wiper speed control and park problems; perform necessary action.	P-3
3.	Diagnose incorrect windshield washer operation; perform necessary action.	P-3

VI. ELECTRICAL/ELECTRONIC SYSTEMS

H. Accessories Diagnosis and Repair

1.	Diagnose incorrect operation of motor-driven accessory circuits; determine necessary action.	P-2
2.	Diagnose incorrect heated glass operation; determine necessary action.	P-3
3.	Diagnose incorrect electric lock operation; determine necessary action.	P-3
4.	Diagnose incorrect operation of cruise control systems; repair as needed.	P-3
5.	Diagnose supplemental restraint system (SRS) concerns; determine necessary action. (Note: Follow manufacturer's safety procedures to prevent accidental deployment.)	P-2
6.	Diagnose radio static and weak, intermittent, or no radio reception; determine necessary action.	P-3

HEATING AND AIR CONDITIONING

For every task in Heating and Air Conditioning, the following safety requirement must be strictly enforced:

Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

VII. HEATING AND AIR CONDITIONING

A. A/C System Diagnosis and Repair

1.	Diagnose unusual operating noises in the A/C system; determine necessary action.	P-2
2.	Identify refrigerant type; conduct a performance test of the A/C system; determine necessary action.	P-1
3.	Leak test A/C system; determine necessary action.	P-1
4.	Inspect the condition of discharged oil; determine necessary action.	P-2
5.	Select oil type; measure, and add oil to the A/C system as needed.	P-2

VII. HEATING AND AIR CONDITIONING

B. Refrigeration System Component Diagnosis and Repair

1. Compressor and Clutch

1.	Diagnose A/C system conditions that cause the protection devices (pressure, thermal, and PCM) to interrupt system operation; determine necessary action.	P-2
2.	Inspect A/C compressor drive belts; replace and adjust as needed.	P-2
3.	Inspect, test, and replace A/C compressor clutch components or assembly.	P-2
4.	Remove and replace A/C compressor and mountings.	P-2

2. Evaporator, Condenser, and Related Components

1.	Determine need for A/C system filter; perform necessary action.	P-3
2.	Remove and inspect A/C system mufflers, hoses, lines, fittings, o-rings, seals, and service valves; perform necessary action.	P-2
3.	Inspect A/C condenser for airflow restrictions; perform necessary action.	P-1
4.	Remove and install receiver/drier or accumulator/drier.	P-2

5.	Remove and install expansion valve or orifice (expansion) tube.	P-2
6.	Inspect evaporator housing water drain; perform necessary action.	P-3

VII. HEATING AND AIR CONDITIONING

C. Heating, Ventilation, and Engine Cooling Systems Diagnosis and Repair

1.	Diagnose temperature control problems in the heater/ventilation system; determine necessary action.	P-2
2.	Perform cooling system, cap, and recovery system tests (pressure, combustion leakage, and temperature); determine necessary action.	P-1
3.	Inspect engine cooling and heater system hoses and belts; perform necessary action.	P-1
4.	Inspect, test, and replace thermostat and housing.	P-1
5.	Determine coolant condition; drain and recover coolant.	P-1
6.	Flush system; refill system with recommended coolant; bleed system.	P-1
7.	Inspect and test fan, fan clutch (electrical and mechanical), fan shroud, and air dams; perform necessary action.	P-1
8.	Inspect and test electrical fan control system and circuits.	P-1
9.	Inspect and test heater control valve(s); perform necessary action.	P-2

VII. HEATING AND AIR CONDITIONING

D. Operating Systems and Related Controls Diagnosis and Repair

1.	Diagnose failures in the electrical controls of heating, ventilation, and A/C (HVAC) systems; determine necessary action.	P-2
2.	Inspect and test A/C-heater blower, motors, resistors, switches, relays, wiring, and protection devices; perform necessary action.	P-2
3.	Test A/C compressor load cut-off systems; determine necessary action.	P-3

4.	Diagnose failures in the vacuum and mechanical components and controls of the heating, ventilation, and A/C (HVAC) system; determine necessary action.	P-2
5.	Inspect and test A/C-heater control panel assembly; determine necessary action.	P-3
6.	Inspect and test A/C-heater control cables and linkages; perform necessary action.	P-3
7.	Inspect and test A/C-heater ducts, doors, hoses, and outlets; perform necessary action.	P-3
8.	Check operation of automatic and semi-automatic heating, ventilation, and air-conditioning (HVAC) control systems; determine necessary action.	P-3

VII. HEATING AND AIR CONDITIONING

E. Refrigerant Recovery, Recycling, and Handling

1.	Verify correct operation and maintenance of refrigerant handling equipment.	P-1
2.	Identify (by label application or use of a refrigerant identifier) and recover A/C system refrigerant.	P-1
3.	Recycle refrigerant.	P-1
4.	Label and store refrigerant.	P-1
5.	Test recycled refrigerant for non-condensable gases.	P-1
6.	Evacuate and charge A/C system.	P-1

ENGINE PERFORMANCE

For every task in Engine Performance the following safety requirement must be strictly enforced:

Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

VIII. ENGINE PERFORMANCE

A. General Engine Diagnosis

1.	Interpret and verify concern; determine necessary action.	P-1
2.	Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action.	P-2
3.	Diagnose unusual engine noise or vibration concerns; determine necessary action.	P-2
4.	Diagnose unusual exhaust color, odor, and sound; determine necessary action.	P-2
5.	Perform engine absolute (vacuum/boost) manifold pressure tests; determine necessary action.	P-1
6.	Perform cylinder power balance test; determine necessary action.	P-1
7.	Perform cylinder compression test; determine necessary action.	P-1
8.	Perform cylinder leakage test; determine necessary action.	P-1
9.	Diagnose engine mechanical, electrical, electronic, fuel, and ignition concerns with an oscilloscope and engine diagnostic equipment; determine necessary action.	P-1
10.	Prepare 4 or 5 gas analyzer; inspect and prepare vehicle for test, and obtain exhaust readings; interpret readings, and determine necessary action.	P-1

VIII. ENGINE PERFORMANCE

B. Computerized Engine Controls Diagnosis and Repair

1.	Retrieve and record stored OBD I diagnostic trouble codes; clear codes.	P-1
2.	Retrieve and record stored OBD II diagnostic trouble codes; clear codes.	P-3
3.	Diagnose the causes of emissions or driveability concerns resulting from failure of computerized engine controls with stored diagnostic trouble codes.	P-1

4.	Diagnose emissions or driveability concerns resulting from failure of computerized engine controls with no stored diagnostic trouble codes; determine necessary action.	P-1
5.	Inspect and test computerized engine control system sensors, powertrain control module (PCM), actuators, and circuits; perform necessary action.	P-2
6.	Obtain and interpret digital multimeter (DMM) readings.	P-1
7.	Access and use electronic service information (ESI).	P-3
8.	Locate and interpret vehicle and major component identification numbers (VIN, vehicle certification labels, and calibration decals).	P-1
9.	Inspect and test power and ground circuits and connections; service or replace as needed.	P-1
10.	Practice recommended precautions when handling static sensitive devices.	P-2
11.	Diagnose driveability and emissions problems resulting from failures of interrelated systems (cruise control, security alarms, suspension controls, traction controls, A/C, automatic transmissions, non-OEM-installed accessories, and similar systems); determine necessary action.	P-2

VIII. ENGINE PERFORMANCE

C. Ignition System Diagnosis and Repair

1.	Diagnose no-starting, driveability, and emissions concerns on vehicles with electronic ignition (EI/DIS)(distributorless) systems; determine necessary action.	P-1
2.	Diagnose no-starting, driveability, and emissions concerns on vehicles with distributor ignition (DI) systems; determine necessary action.	P-1
3.	Inspect and test ignition primary circuit wiring and components; perform necessary action.	P-2
4.	Inspect and test distributor; perform necessary action.	P-3
5.	Inspect and test ignition system secondary circuit wiring and components; perform necessary action.	P-2
6.	Inspect and test ignition coil(s); perform necessary action.	P-2

7.	Check and adjust (where applicable) ignition system timing and timing advance/retard.	P-1
8.	Inspect and test ignition system pick-up sensor or triggering devices; perform necessary action	P-2
9.	Inspect and test ignition control module; perform necessary action.	P-2

VIII. ENGINE PERFORMANCE

D. Fuel, Air Induction, and Exhaust Systems Diagnosis and Repair

1.	Diagnose hot or cold no-starting, hard starting, poor driveability, incorrect idle speed, poor idle, flooding, hesitation, surging, engine misfire, power loss, stalling, poor mileage, dieseling, and emissions problems on vehicles with carburetor-type fuel systems; determine necessary action.	P-3
2.	Diagnose hot or cold no-starting, hard starting, poor driveability, incorrect idle speed, poor idle, flooding, hesitation, surging, engine misfire, power loss, stalling, poor mileage, dieseling, and emissions problems on vehicles with injection-type fuel systems; determine necessary action.	P-1
3.	Inspect fuel tank and fuel cap, fuel lines, fittings, and hoses; perform necessary action.	P-2
4.	Check fuel for contaminants and quality; determine necessary action.	P-2
5.	Inspect and test mechanical and electrical fuel pumps and pump control systems; perform necessary action.	P-2
6.	Replace fuel filters.	P-1
7.	Inspect and test fuel pressure regulation system and components of injection-type fuel systems; perform necessary action.	P-1
8.	Inspect and test cold enrichment system and components; perform necessary action.	P-3
9.	Remove, service, and install throttle body; adjust related linkages.	P-2
10.	Inspect, test, and clean fuel injectors.	P-2
11.	Inspect throttle body mounting plates, air induction and filtration system, intake manifold, and gaskets; perform necessary action.	P-2

12.	Check idle speed and fuel mixture.	P-2
13.	Adjust idle speed and fuel mixture.	P-3
14.	Remove, inspect, and test vacuum and electrical circuits, components and connections of fuel system; perform necessary action.	P-2
15.	Inspect exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shield(s); perform necessary action.	P-2
16.	Perform exhaust system back-pressure test; determine necessary action.	P-1
17.	Test the operation of turbocharger/supercharger systems; determine necessary action	P-3

VIII. ENGINE PERFORMANCE

E. Emissions Control Systems Diagnosis and Repair

1. Positive Crankcase Ventilation

1.	Diagnose oil leaks, emissions, and driveability problems resulting from failure of the positive crankcase ventilation (PCV) system; determine necessary action.	P-1
2.	Inspect and test positive crankcase ventilation (PCV) filter/breather cap, valve, tubes, orifices, and hoses; perform necessary action.	P-2

2. Exhaust Gas Recirculation

1.	Diagnose emissions and driveability problems caused by failure of the exhaust gas recirculation (EGR) system; determine necessary action.	P-1
2.	Inspect and test valve, valve manifold, and exhaust passages of exhaust gas recirculation (EGR) systems; perform necessary action.	P-2
3.	Inspect and test vacuum/pressure controls, filters, and hoses of exhaust gas recirculation (EGR) systems; perform necessary action.	P-2
4.	Inspect and test electrical/electronic sensors, controls, and wiring of exhaust gas recirculation (EGR) systems; perform necessary action.	P-2

3. Exhaust Gas Treatment

1.	Diagnose emissions and driveability problems resulting from failure of the secondary air injection and catalytic converter systems; determine necessary action.	P-2
2.	Inspect and test mechanical components of secondary air injection systems; perform necessary action.	P-2
3.	Inspect and test electrical/electronically-operated components and circuits of air injection systems; perform necessary action.	P-2
4.	Inspect and test components of catalytic converter systems; perform necessary action.	P-2

4. Intake Air Temperature Controls

1.	Diagnose emissions and driveability problems resulting from failure of the intake air temperature control system; determine necessary action.	P-3
2.	Inspect and test components of intake air temperature control system; perform necessary action.	P-3

5. Early Fuel Evaporation (Intake Manifold Temperature) Controls

1.	Diagnose emissions and driveability problems resulting from failure of early fuel evaporation control system; determine necessary action.	P-3
2.	Inspect and test components of early fuel evaporation control system; perform necessary action.	P-3

6. Evaporative Emissions Controls

1.	Diagnose emissions and driveability problems resulting from failure of evaporative emissions control system; determine necessary action.	P-2
2.	Inspect and test components and hoses of evaporative emissions control system; perform necessary action.	P-2

VIII. ENGINE PERFORMANCE

F. Engine Related Service

1.	Adjust valves on engines with mechanical or hydraulic lifters.	P-1
2.	Verify correct camshaft timing; determine necessary action.	P-1
3.	Verify engine operating temperature; determine necessary action.	P-1
4.	Perform cooling system pressure tests; check coolant condition; inspect and test radiator, pressure cap, coolant recovery tank, and hoses; perform necessary action.	P-1
5.	Inspect and test thermostat, by-pass, and housing; perform necessary action.	P-1
6.	Inspect and test mechanical/electrical fans, fan clutch, fan shroud/ducting, air dams, and fan control devices; perform necessary action.	P-2

Task List Priority Item Totals (by area)

I. Engine Repair

P-1 = 16
P-2 = 23
P-3 = 20

II. Automatic Transmission and Transaxle

P-1 = 14
P-2 = 16
P-3 = 11

III. Manual Drive Train and Axles

P-1 = 13
P-2 = 23
P-3 = 22

IV. Suspension and Steering

P-1 = 21
P-2 = 26
P-3 = 14

V. Brakes

P-1 = 23
P-2 = 17
P-3 = 9

VI. Electrical/Electronic Systems

P-1 = 21
P-2 = 16
P-3 = 12

VII. Heating and Air Conditioning

P-1 = 16
P-2 = 15
P-3 = 7

VIII. Engine Performance

P-1 = 27
P-2 = 31
P-3 = 11

APPLIED ACADEMICS AND WORKPLACE SKILLS

The following Applied Academic Skills general statements were developed in cooperation with the Vocational-Technical Education Consortium of States (V-TECS). The process involved using the NATEF task list and the Basic/Essential Skills Taxonomy developed at Arizona State University by Dr. Lester Snyder.

Committee meetings were held in the following four cities: Atlanta, Georgia; Boston, Massachusetts; Cincinnati, Ohio; and Phoenix, Arizona. At each of the meetings, ASE Certified Master Automobile technicians were used as experts in the automotive service industry. V-TECS used experts in three academic areas (language arts, mathematics, and science) to help the committees understand the specific definitions of the concepts used in the taxonomy.

The committees were asked to identify the academic skills required to perform each task listed in the eight automobile areas. Their responses were recorded using the Basic/Essential Skills Taxonomy codes and were put into a database. After all the meetings were completed, a composite or unduplicated list of the codes was generated for language arts, mathematics, and science. Specific statements related to the use of the academic skill in the automotive industry were then written. A matrix was built to show the relationship between the composite list and each of the eight automobile areas. The general statements included in this manual were developed from the specific statements. Several crosschecks and reviews were conducted to ensure the accuracy of the statement and the relationship to the NATEF task list.

The Workplace Skills List was generated by having the committees identify the workplace skills from the V-TECS/ILLINOIS WORKPLACE SKILLS LIST that are important for employment as an automobile technician.

** Please contact the NATEF office to order the *Applied Academics and Workplace Skills for Automobile Technicians* book. This book includes the unduplicated list of applied academic skills in all eight automobile areas, complete with statements of their use by automobile technicians; the matrix; the definitions of the Basic/Essential Skills codes; the general narrative statements; the Workplace Skills List; and the NATEF Task List.

The information in the book will provide a common vocabulary for instructors and administrators to use in achieving academic and vocational skill standards. This information can be used by programs to document the academic skills taught in automotive technical classes. The examples for teaching an academic concept in an applied context will also be useful for schools when planning, designing, or writing curricula. **

NARRATIVE FOR LANGUAGE ARTS RELATED ACADEMIC SKILLS
for all
NATEF Automobile Technician Task Lists

The automobile technician must be proficient in the following Language Arts and Communications related academic skills that are embedded in the occupation. Using these skills the technician must be able to:

- Request, collect, comprehend, evaluate, and apply oral and written information gathered from customers, associates, and supervisors regarding problem symptoms and potential solutions to problems.

- Identify the purpose for all written and oral communication and then choose the most effective strategies for listening, reading, speaking, and writing to facilitate the communication process.

- Adapt a reading strategy for all written materials, e.g. customer's notes, service manuals, shop manuals, technical bulletins, etc., relevant to problem identification, diagnosis, solution, and repair.

- Attend to verbal and nonverbal cues in discussions with customers, supervisors, and associates to verify, identify, and solve problems.

- Use study habits and techniques, i.e. previewing, scanning, skimming, taking notes, etc., when reviewing publications (shop manuals, references, databases, operator's manuals, and text resources) for problem solving, diagnosis, and repair.

- Use prior knowledge learned from solving similar problems to diagnose and repair specific problems.

- Write clear, concise, complete, and grammatically accurate sentences and paragraphs.

- Write warranty reports and work orders to include information regarding problem resolution and the results of the work performed for the customer or manufacturer.

- Comprehend and apply industry definitions and specifications to diagnose and solve problems in all automotive systems and components.

- Follow all oral/written directions that relate to the task or system under study.

- Comprehend and use problem-solving techniques and decision trees that are contained in service manuals to determine cause-and-effect relationships.

- Scan service manuals and databases to locate specific information for problem-solving purposes.
- Use the service manual to identify the manufacturer's specifications for system parameters, operation, and potential malfunctions.
- Interpret charts, tables, or graphs to determine the manufacturer's specifications for system operation to identify out-of-tolerance systems and subsystems.
- Supply clarifying information to customers, associates, parts supplier, and supervisors.

NARRATIVE FOR MATHEMATICS RELATED ACADEMIC SKILLS
for all
NATEF Automobile Technician Task Lists

The automobile technician must be proficient in the following mathematics-related academic skills that are embedded in the occupation. Given these skills the technician must be able to:

- Determine the proper sequence of arithmetic operations to arrive at a solution that can be compared to other specifications when comparing system measurements to the manufacturer's specifications.
- Add two or more whole numbers, fractions, or decimals to determine component conformance of multiple measurements with the manufacturer's specifications.
- Subtract whole numbers, fractions, or decimals to arrive at a difference for comparison with the manufacturer's specifications.
- Divide decimals to determine measurement conformance with the manufacturer's specifications.
- Convert variables presented orally to a mathematical form that provides for an algebraic solution.
- Estimate the results of basic arithmetic operations, and accurately round up or down depending on the appropriate rule for the situation.
- Analyze and solve problems requiring the use of fractions, decimals, ratios, or percentages by a direct or indirect variation of the numerical elements of the problem.
- Determine the irrelevant and/or missing data needed to solve a problem.
- Determine and interpret place value (tenths, hundredths, thousandths) when conducting precision measurements.
- Use Centigrade or Fahrenheit measurement scales to determine the existing temperature of substances such as a coolant or lubricant.
- Use English and metric volume measurement techniques to determine the volume of a system, component, or cylinder.
- Use conventional symbols (E for voltage, etc.) to solve circuit parameter calculations using formulas such as Ohm's Law, E=IR.

- Understand that if the described problem has certain conditions (symptoms), then a limited number of solutions to the problem apply.
- Understand the relationship between the frequency of the occurrence of a problem (symptom) and the probability of accurately predicting the problem.
- Calculate the average (mean) of several measurements to determine the variance from the manufacturer's specifications.
- Use English and metric angle and distance measurements and techniques to determine angle variances from the manufacturer's specifications.
- Solve problems that involve determining the relative proportion of desired versus undesired ingredients or elements of a mixture, and determine if that proportion is within the manufacturer's specifications.
- Comprehend and use standards defined by each manufacturer for the system being analyzed.
- Convert test readings that are in decimal or fraction form to a ratio or percent for comparison with the manufacturer's specifications for the sub-system.
- Know when to use an estimated performance value versus an exact value, basing the decision on the system being analyzed or repaired.
- Visually perceive the geometric relationship of systems and sub-systems that require alignment.
- Construct or interpret a chart, table, graph, or symbol that depicts a range of performance characteristics that can be used for comparing various system operational conditions.
- Use measurement devices to determine the parallelism or perpendicularity of chassis, suspension, and other vehicle systems requiring geometric alignment.
- Use formulas to indirectly confirm systems that are outside of the manufacturer's specifications.
- Verify that the relationship between parallel lines and angles concurs with the manufacturer's specifications when diagnosing a system's malfunction.
- Visually formulate a belt (e.g., suspension/drive) angle and verify conformance to the manufacturer's specified angle.

- Measure timed or sequenced operating parameters to determine conformance with the manufacturer's specifications.
- Use English and metric scales to determine the conformance of components to the manufacturer's specified weight.
- Determine the degree of conformance to the manufacturer's specifications for length, volume, and other appropriate measurements in the English and/or metric system.
- Distinguish the congruence of the measured tolerances with those specified by the manufacturer.
- Measure and/or test with tools designed for English or metric measurements, then convert the result to the manufacturer's system used for specifying the correct measurement or tolerance.
- Compute mentally whether the observed measurement is out of tolerance when comparing the observed measurement to the manufacturer's specifications.
- Solve problems that involve determining whether the proportion of the existing volume compares to the manufacturer's specifications and is within the recommended tolerance.
- Distinguish whether a measurement or tolerance is equal or not equal to the manufacturer's specifications.

NARRATIVE FOR SCIENCE RELATED ACADEMIC SKILLS
for all
NATEF Automobile Technician Task Lists

The automobile technician must be proficient in the following science-related academic skills that are imbedded in the occupation. Using these skills the technician must be able to:

- Analyze and evaluate waste products from the repair task and dispose of the parts, residue, or trash according to applicable federal, state, and local rules and regulations.
- Follow all safety regulations and procedures while performing any task.
- Use the information provided in service manuals, charts, tables, or graphs to determine the manufacturer's specifications for system(s) operation(s) and the appropriate repair/replacement procedure.
- Develop a hypothesis regarding the cause of the problem and test the hypothesis to determine the solution to the problem.
    1. identify the problem
    2. gather information
    3. develop hypothesis
    4. take action
    5. check results
- Convert measurements taken using the English or metric system to specifications stated in terms of either system.
- Explain and demonstrate an understanding of the chemical reaction that occurs in an automobile regarding the combustion of fuels, catalytic converters, and contamination when introduced into systems.
- Explain the purpose of additives in lubricants.
- Demonstrate an understanding of the kinetic and potential energy relationships that occur in valve systems, ignition systems, and other stored energy systems, such as springs and fuels, and determine efficiency.
- Demonstrate an understanding of the role of balanced and unbalanced forces on linear and rotating vehicle assemblies.
- Explain the relationship of centrifugal/centripetal force to the failure of rotating systems.
- Explain the ignition characteristics of fuels resulting from varying levels of fractional distillation.

- Demonstrate an understanding of how fuel characteristics effect combustion in an automotive engine.
- Demonstrate an understanding of the effect of heat on automotive systems.
- Explain the concept of heat transfer in terms of conduction, convection, and radiation in automotive systems.
- Demonstrate an understanding of the expansion and contraction of system parts as a result of heat generated during use and the cooling of the system when not in operation.
- Demonstrate an understanding of the effect that adding heat will cause in a state of matter, such as solid to liquid to gas.
- Explain the role of insulation in maintaining stable temperatures.
- Demonstrate an understanding of refraction in fiber optic systems.
- Explain that dyes added to lubricants fluoresce in ultraviolet light and provide a process for determining the source of leakage.
- Demonstrate an understanding of the process of acceleration and deceleration as a function of weight and available power.
- Demonstrate an understanding of the reaction of fluid to the motion of a valve or piston.
- Demonstrate an understanding of the circular motion of a vehicle as it relates to such events as toe-out on turns and tracking.
- Demonstrate an understanding of the types of vibrations caused by out-of-balance or excessively worn systems.
- Explain to a customer how sound can be amplified due to resonant cavities and other physical characteristics of the vehicle.
- Explain and demonstrate an understanding of how sound generated in one place in the body and engine can be carried to other parts of the engine through metal and other materials.
- Explain the need for sound deadening and vibration damping materials to control the level of sound in the passenger compartment.
- Demonstrate an understanding of the relationship of the perceived intensity to the decibel level of a noise.

- Explain the relationship of the frequency of the sound to a normal or abnormally operating system.
- Explain and demonstrate an understanding of the role of listening to sounds as part of the trouble-shooting process.
- Explain that the presence of overtones may indicate changes in the vibrations of various systems.
- Demonstrate an understanding of the relationship of barometric pressure to engine performance (horsepower).
- Explain the relationship of engine torque to vehicle performance.
- Explain how levers and pulleys can be used to increase an applied force or distance.
- Identify the effect of the pH of a solution on chemical changes in a system.
- Identify the characteristics that define a system that is operating within the manufacturer's specifications.
- Use precision measuring devices to determine if wear and adjustments are within the manufacturer's specifications, and to assure that repair or replacement parts meet the manufacturer's specifications.
- Use tension gauges, such as a torque wrench, to measure the force or tension required to tighten connections to the manufacturer's specifications.
- Use a scale to measure component weight to balance rotating systems.
- Use pressure measuring tools to determine pressures in hydraulic or pneumatic systems and compare to the manufacturer's specifications.
- Use direct and indirect methods to measure system temperatures and then convert to Fahrenheit/Centigrade as required.
- Use direct and indirect methods to measure time and compare the results to the manufacturer's specifications.
- Use direct and indirect methods to measure the volume of liquids in a system and compare to the manufacturer's specifications.

- Use computer databases for information retrieval and input devices to process information for customers, billing purposes, warranty work, and other record-keeping purposes.

- Explain how an applied force at one location can be transmitted via fluid pressure to provide a force at a remote location.

- Explain catalytic converter principles which modify emission gases at the atomic level to provide a low level of HC, CO, and NOx in the final exhaust.

- Explain the role that friction plays in acceleration and deceleration of objects as illustrated by transmitting motion to a part not physically connected to the powered part.

- Explain to the customer the need for lubrication of adjacent parts to minimize friction as a result of movement at the junction of the parts.

- Explain the necessity of knowing that the hardness of a metal determines, in part, its function and location in the automobile.

- Explain the dynamic control properties of a hydraulic system.

- Explain the surface processes that occur on system seals due to the absorption of the contained materials.

- Demonstrate an understanding of how the deterioration in an engine's performance can be caused by a chemical reaction that occurs in a liquid that has been contaminated.

- Demonstrate an understanding of how torque relates to force and angular acceleration.

- Demonstrate an understanding of how cams, pulleys, and levers are used to multiply force or transfer directions of force.

- Explain how rotational motion is changed to linear motion and the need for balance in rotating systems.

- Demonstrate an understanding of how variances in flow rate in airflow sensors or cooling systems can effect engine performance.

Electrical/Tolerances

- Explain and demonstrate an understanding of the properties of electricity that impact the lighting, engine management, and other electrical systems in the vehicle.

- Demonstrate an understanding of the characteristics of a quality electrical ground and explain the problems associated with an inadequate electrical circuit ground.
- Explain voltage and current flow in series and parallel circuits.
- Demonstrate an understanding of the processes used to locate a short circuit in the electrical/electronic system.
- Demonstrate an understanding of the role of the alternator in maintaining battery and system voltage.
- Demonstrate an understanding of the role of solar panels in maintaining battery voltage and operating selected accessories.
- Explain and demonstrate an understanding of the ignition coil's role in generating the high voltages required to fire the sparkplug.
- Demonstrate an understanding of the correct procedure used to measure the electrical parameters of voltage, current, resistance, or power.
- Explain and demonstrate an understanding of the role of a fuse or fusible link as a protective device in an electrical or electronic circuit.
- Explain and demonstrate an understanding of the use of Ohm's Law in verifying circuit parameters (resistance, voltage, amperage).
- Explain and demonstrate an understanding of the relationship of resistance to heat, voltage drop, and circuit parameters.
- Explain and demonstrate an understanding of system voltage generation, uses, and characteristics.
- Demonstrate an understanding of the ion transfer process that occurs in an automotive battery.
- Explain the conductivity problems in a circuit when connectors corrode due to electrochemical reactions.
- Explain the relationship between electrical current in a conductor and the magnetic field produced in a coil such as the starter solenoid.
- Explain the ability of a coil to increase battery voltage to the level required to fire a spark plug.

- Explain the effect of magnetic fields on unshielded circuits in selected control modules.
- Explain the need for a specific gravity test of battery electrolyte to determine charge.
- Use precision electrical test equipment to measure current, voltage, resistance, continuity, and/or power.
- Demonstrate an understanding of the role of capacitance in timer circuits, such as RC timers or MAP sensors, where the changing manifold pressure causes two metal discs to act like a capacitor by sending varying voltage to the electronic engine control system.
- Demonstrate an understanding of the capacity of semiconductor devices to modify rapidly engine operation parameters depending on multiple inputs from engine operational sensors.
- Explain how the movement of a conductor in a magnetic field can generate electricity.
- Demonstrate an understanding of the role of mechanical transducers in sending electrical control signals to modify system operating characteristics.
- Demonstrate an understanding of the purpose of photocells and measurement processes relative to determining output.

WORKPLACE SKILLS

IDENTIFIED AS BEING IMPORTANT BY THE NATEF AUTOMOTIVE TECHNICIANS RELATED ACADEMIC SKILLS COMMITTEE FROM THE V-TECS/ILLINOIS WORKPLACE SKILLS LIST.

A. DEVELOPING AN EMPLOYMENT PLAN

1. Match interests to employment area.
2. Match aptitudes to employment area.
3. Identify short-term work goals.
4. Match attitudes to a job area.
5. Match physical capabilities to a job area.
6. Demonstrate a drug-free status.

B. SEEKING AND APPLYING FOR EMPLOYMENT OPPORTUNITIES

1. Identify steps in applying for a job.
2. Locate employment opportunities.
3. Identify job requirements.
4. Identify conditions for employment.
5. Evaluate job opportunities.
6. Prepare a resume.
7. Write job application letter.
8. Complete job application form.
9. Prepare for job interview.
10. Dress for job interview.

C. ACCEPTING EMPLOYMENT

1. Apply for social security number.
2. Complete state and federal tax forms.
3. Complete employees withholding allowance certificate form W-4.

D. COMMUNICATING ON THE JOB

1. Communicate orally with others.
2. Ask questions about task.
3. Follow written and oral directions.
4. Prepare written communication.
5. Interpret the use of body language.
6. Use telephone etiquette.

E. INTERPRETING THE ECONOMICS OF WORK

1. Describe responsibilities of an employee.
2. Describe responsibilities of employer or management.
3. Investigate opportunities and options for business ownership.

F. MAINTAINING PROFESSIONALISM

1. Participate in employment orientation.
2. Treat people with respect.
3. Exhibit positive behavior.
4. Comply with organizational expectations.
5. Comply with company dress and appearance standards.
6. Use job-related terminology.
7. Participate in meetings in a positive and constructive manner.
8. Assess business image and products/services.

G. ADAPTING/COPING WITH CHANGE

1. Identify the elements of the job transition.
2. Exhibit ability to handle stress.
3. Recognize need to change or quit a job.
4. Write a letter of resignation.

H. SOLVING PROBLEMS AND CRITICAL THINKING

1. Clarify purposes and goals.
2. Identify the problem.
3. Employ reasoning skills.
4. Assess employer and employee responsibility in solving a problem.
5. Evaluate options.

6. Estimate results of implemented options.
7. Set priorities.
8. Identify solutions to the problem and their impact.
9. Select and implement a solution to a problem.
10. Prioritize and organize workloads.

I. MAINTAINING A SAFE AND HEALTHY ENVIRONMENT

1. Follow conservation/environmental practices and policies.
2. Comply with safety and health rules/procedures.
3. Identify hazardous substances in the work place.
4. Use and maintain proper tools and equipment.
5. Maintain work area.
6. Act during emergencies.

J. DEMONSTRATING WORK ETHICS AND BEHAVIOR

1. Follow rules, regulations and policies as established.
2. Implement responsibilities of job position.
3. Maintain regular attendance.
4. Assume responsibility for decisions and actions.
5. Demonstrate willingness to learn.
6. Practice time management.
7. Practice cost effectiveness.
8. Apply ethical reasoning.
9. Display initiative.
10. Display assertiveness.
11. Exhibit pride.

K. DEMONSTRATING TECHNOLOGY LITERACY

1. Demonstrate basic keyboarding skills.
2. Demonstrate basic knowledge of computing.
3. Recognize impact of technological changes on tasks and people.

L. MAINTAINING INTERPERSONAL RELATIONSHIPS

1. Value individual diversity.
2. Respond to praise or criticism.
3. Provide constructive praise or criticism.

4. Channel and control emotional reactions.
5. Resolve conflicts.
6. Display a positive attitude.
7. Identify and react to sexual intimidation/harassment.

M. DEMONSTRATING TEAMWORK

1. Identify style of leadership used in teamwork.
2. Match team member's skills and group activity.
3. Work with team members.
4. Complete a team task.
5. Evaluate outcomes.

TOOLS AND EQUIPMENT

Local employer needs and the availability of funds are key factors for determining each program's structure and operation. The NATEF Standards recognize that not all programs have the same needs, nor do all programs teach 100 % of the NATEF tasks. Therefore, the basic philosophy for the tools and equipment requirement is as follows: *for all tasks which are taught in the program, the training should be as thorough as possible with the tools and equipment necessary for those tasks*. In other words, if a program does not teach a particular task, the tool from the tool list associated with that task is not required (unless of course it is required for a task that is taught in another area).

The NATEF tool lists are organized into three basic categories: *Hand Tools, General Lab/Shop Equipment*, and *Specialty Tools and Equipment*. The specialty tools section is further separated into the eight NATEF task categories. When referring to the tools and equipment list, please note the following:

1. The organization of the tool list is not intended to dictate how a program organizes its tool crib or student tool sets (i.e., which tools should be in a student set, if utilized, and which should be in the tool crib or shop area).
2. Quantities for each tool or piece of equipment are determined by the program needs; however, sufficient quantities to provide quality instruction should be on hand.
3. For *Specialty Tools and Equipment*, the program need only have those tools for the areas being certified.
4. Programs may meet the equipment requirements by borrowing special equipment or providing for off-site instruction (e.g., in a dealership or independent repair shop). Use of borrowed or off-site equipment *must* be appropriately documented.
5. No specific brand names for tools and equipment are specified or required.
6. Although the NATEF Standards recommend that programs encourage their students to begin to build their own individual tools sets prior to entry into the industry, there is no requirement to do so. NOTE: Industry surveys indicate that most (90%) employers require that a candidate for employment provide his/her own basic hand tool set in order to be hired as an entry-level automobile technician.

HAND TOOLS

(Contained in individual sets or the tool crib in sufficient quantities to permit efficient instruction)

Adjustable Wrench - 6" and 12"
Air Blow Gun (meeting OSHA requirements)
Allen (Wrench or Socket) Set - Standard (.050" - 3/8")
Allen (Wrench or Socket) Set - Metric (2mm - 7mm, 10mm, 12mm)
Battery Post Cleaner
Battery Terminal Pliers
Battery Terminal Puller
Brake Spoon
Chisels:
- Cape 5/16"
- Cold 3/8", 3/4"

Chisel Holder
Claw Type Pickup Tool
Combination Wrenches:
- Standard (1/4" – 1 1/4")
- Metric (7mm - 24mm)

Crowfoot Wrench Set - Metric
Crowfoot Wrench Set - Standard
Ear Protection
Feeler Gauge (Blade Type):
- .002" - .040"
- .006mm - .070mm

Files:
- Coarse 6" and 12"
- Fine 6" and 12"
- Half Round 12"
- Round 6" and 12"

Flare Nut (tubing) Wrenches:
- 3/8" - 3/4"
- 10mm - 17mm

Flashlight
Fuse Puller
Hack Saw
Hammers:
- 16 oz. Ball Peen
- Brass
- Dead Blow Plastic Mallet
- Plastic Tip
- Rubber Mallet

Inspection Mirror
Jumper Wire Set (with various adapters)
Magnetic Pickup Tool
Pliers:
- Combination 6"
- Hose Clamp
- Locking Jaw
- Needle Nose 6"
- Side Cutting
- Slip Joint (Water Pump)

Pry Bars:
- Rolling Head
- Straight

Punches:
- Center
- Brass Drift
- Pin 1/8", 3/16", 1/4", 5/16"
- Taper 3/8", 1/2", 5/8"

Safety Glasses (meeting OSHA requirements)
Scraper:
- Carbon 1"
- Gasket 1"

Screwdriver - Blade Type:
- Stubby
- 6", 9", 12"
- Offset

Screwdriver - Phillips:
- Stubby #1, #2
- 6" #1, #2
- 12" #3
- Offset #2

Screwdriver - Impact Driver Set
Screw Starter:
- Phillips
- Standard

Socket Set - 1/4" Drive:
- 1/4" - 1/2" Standard Depth
- 1/4" - 1/2" Deep
- 6mm - 12mm Standard Depth
- 6mm - 12mm Deep
- Flex/Universal Type
- 3", 6" Extensions
- Ratchet

Socket Set - 3/8" Drive:
- 5/16" - 3/4" Standard Depth (6 point)
- 3/8" - 3/4" Deep (6 point)
- 10mm - 19mm Standard Depth
- 10mm - 19mm Deep
- 3", 5", 10" Extensions
- Flexhead Ratchet
- Ratchet
- Spark Plug Sockets 5/8", 13/16"
- Speed Handle
- Universal Joint
- Flexible Socket Set 3/8" - 3/4"
- Flexible Socket Set 10mm - 19mm

Socket Set - 1/2" Drive:
- 7/16" - 1 1/8" Standard Depth
- 7/16" - 1 1/8" Deep
- 10mm - 24mm Standard Depth
- 10mm - 24mm Deep
- 3", 6", 12" Extensions
- Flex Handle (Breaker Bar)
- Ratchet

Spark Plug Feeler Gauge (Gap Tool)
Tape Measure – Standard and Metric
Test Light (12V)
Tire Pressure Gauge
Torque Wrench:
- 3/8" Drive (10 - 250 lb. in.)
- 3/8" Drive (5 - 75 lb. ft.)
- 1/2" Drive (50 - 250 lb. ft.)

Torx® Set (screwdrivers and/or sockets):
- T-8 to T-60

Wire Brush

GENERAL LAB/SHOP EQUIPMENT

The tools and equipment on this list are used in general lab/shop work but are not generally considered to be individually owned hand tools. A well equipped, certified program should have all of these general tools and equipment readily available and in sufficient quantity to provide quality instruction.

Air Chisel Set (various bits)
Air Compressor and Hoses
Air Pressure Regulator
Air Ratchet (3/8" drive)
Automotive Stethoscope (electronic recommended)
Axle Stands (Safety Stands)
Battery Charger
Battery/Starter/Charging System Tester
Bearing Packer (hand operated)
Belt Tension Gauge
Bench or Pedestal Grinder
Compression Tester
Computer Scan Tool (hand held) or Personal Computer (PC) with interface capability for on-board diagnostics (OBD II compliant recommended)
Coolant/Combustion Gas Detector (Recommended)
Coolant Tester
Cooling System Pressure Tester and Adapters
Constant Velocity Joint (CV) Service Tools:
    Boot Installation Tool
    Boot Clamp Pliers or Crimping Ring
Creeper
Cylinder Leakage Tester
Dial Indicator with Flex Arm and Clamp Base
Digital Multi-meter with various lead sets
Drain Pans
Drill - 3/8" variable speed, reversible
Drill - 1/2" variable speed, reversible
Electric Heat Gun
Engine Coolant Recovery Equipment or Recycler or Coolant Disposal Contract Service
Extension Cords
Face Shields
Fender Covers
Floor Jack (1½ Ton Minimum)
Hand Held Vacuum Pump
Hoist(s)

Hydraulic Press with adapters
Impact Socket Sets - 3/8" Drive (Standard and Metric)
Impact Sockets - 1/2" Drive (7/16" - 1 1/8")
Impact Sockets - 1/2" Drive (12mm – 24mm)
Impact Sockets – 1/2" Drive Deep (30 mm, 32 mm, 36mm)
Impact Wrench - 1/2" Drive
Impact Wrench - 3/8" Drive
Jumper Cables
Master Puller Set
Micrometer (Depth)
Micrometers - 0-1", 1-2", 2-3", 3-4", 4-5" (Outside Type)
Oil Can - Pump Type
Oil Filter Wrench
Oxy-Acetylene Torch
Parts Cleaning Tank and Gloves (non-solvent based cleanser suggested)
Remote Starter Switch
Screw Extractor Set
Seat Covers
Snap Ring Pliers Set - external
Snap Ring Pliers Set - internal
Soldering Gun
Soldering Iron (25 Watt Pencil Tip)
Spark Plug Boot Puller
Tach/Dwell Meter
Tap and Die Set - Standard
Tap and Die Set - Metric
Thread Repair Insert Kit
Tire Inflator Chuck
Trouble/Work Lights (Fluorescent Preferred)
Tube Quick Disconnect Tool Set
Tubing Bender
Tubing Cutter/Flaring Set (Double-lap and ISO)
Twist Drill Set - 1/64" - 1/2"
Valve Core Removing Tool
Vernier Calipers
    0 - 6"
    0 - 125mm
Waste Oil Receptacle with extension neck and funnel
Wheel Chocks
Workbenches with vises

SPECIALTY TOOLS AND EQUIPMENT

This section covers the tools and equipment a lab/shop should have for training in any given specialty area. This equipment is specialized and it must be available in the lab/shop or to the program. No specific type or brand names are identified because they will vary in each local situation.

SUSPENSION & STEERING

Ball Joint Press and other Special Tools
Brake Pedal Depressor
Hand Grease Gun
Inner Tie Rod End Tool
Pitman Arm Puller
Power Steering Pump Pulley Special Tool Set (appropriate for units being taught)
Shock Absorber Tools
Spring/Strut Compressor Tool
Steering Column Special Tool Set (appropriate for teaching units being utilized)
Tie Rod Puller
Tire Mounting Machine (rim clamp suggested)
Wheel Alignment Equipment-4 wheel (including alignment tools)
Wheel Balancer - Electronic Type
Wheel Weight Pliers

BRAKES

Brake Bleeder, Pressure
Brake Disc Micrometer
Brake Drum Micrometer and Calibration Equipment
Brake Lathe (with disc and drum service attachments - mobile or stationary)
Brake Shoe Adjusting Gauge
Brake Spring Remover/Installer
Brake Spring Pliers
Bearing Seal and Race Drive Set

HEATING AND AIR CONDITIONING

A/C Compressor Clutch Service Tools
A/C Service Port Adapter Set
Leak Detector (SAE Standard)
Manifold Gauge Set or equivalent (R-12 and HFC-134a)
Refrigerant Charging Station (R-12 and HFC-134a) or equivalent
Refrigerant Identification Equipment (suggested)
Refrigerant Recovery/Recycling Machine (R-12 and HFC-134a)
Thermometer

ENGINE PERFORMANCE

Dual Trace Lab Scope
Engine Analyzer (with ignition display capability)
Four or Five Gas Exhaust Analyzer
Fuel Injection Cleaner
Fuel Injection Pressure Gauge Sets with Adapters
Injector Pulse Tester
Logic Probe (suggested)
Oxygen Sensor Socket
Pinch-off Pliers
Sending Unit Socket(s)
Spark Plug Thread Tap
Spark Tester
Static Strap
Timing Advance Light
Vacuum/Pressure Gauge

AUTOMATIC TRANSMISSION/TRANSAXLE

Hydraulic Pressure Gauge Set
Front Wheel Drive Engine Support Fixture
Transaxle Removal and Installation Equipment
Transmission Jack(s)
Transmission/Transaxle Holding Fixtures
Transmission/Transaxle Special Tool Sets (appropriate for units being utilized)

ELECTRICAL/ELECTRONIC SYSTEMS

Battery Hydrometer
Connector Pick Tool Set
Headlight Aimer or Screen
Wire and Terminal Repair Kit

MANUAL DRIVE TRAIN AND AXLES

Clutch Alignment Set
Clutch Pilot Bearing/Bushing Puller/Installer
Front Wheel Drive Engine Support Fixture
Transaxle Removal and Installation Equipment
Special Tools for Transmissions/Transaxles (appropriate for units being taught)
Transmission/Transaxle Holding Fixtures
Transmission Jack(s)
Universal Joint Tools

ENGINE REPAIR

Ball (Small Hole) Gauges
Cam Bearing Driver Set (suggested)
Cylinder Deglazer
Dial Bore Indicator
Engine Stands/Benches
Inside Micrometer Set:
- 0 - 6"
- 0 - 125mm

Oil Pressure Gauge (or equivalent)
Oil Priming Tool (oil pump drive)
Outside Micrometer Set:
- 0 - 6"
- 0 - 125mm

Portable Crane - 1/2 Ton
Ridge Reamer
Ring Compressor
Ring Expander
Ring Groove Cleaner
Straight Edge
Telescopic Gauge Set
Torque Angle Gauge
Transaxle Removal and Installation Equipment
V-Blocks

Valve and Valve Seat Resurfacing Equipment
Valve Guide Repair Tools
Valve Spring Compressor
Valve Spring Tester